PHYSICS ABSTRACTS

SECTION A

of

SCIENCE ABSTRACTS

SECTION A, PHYSICS

SECTION B, ELECTRICAL ENGINEERING

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RELATED SUBJECTS CONTAINED IN SECTION B (ELECTRICAL ENGINEERING ABSTRACTS)

Mechanical testing
Non-destructive testing
Industrial radiography
Corrosion
Electrical and magnetic measurements and instruments
Electronic relays and counters
Automatic control mechanisms
Applied electrochemistry
Photocells
Thermionic tubes
Cathode-ray tubes
X-ray tubes
Induction accelerators
Cyclotrons
Amplifiers
Radio-wave propagation
Mechanical engineering
Heat engines
Illumination
Metallurgy

NOTE ON THE ARRANGEMENT OF ABSTRACTS

The Abstracts are classified by subject according to the Universal Decimal Classification, and arranged in order of their U.D.C. numbers, which are printed at the head of the Abstract on the left. Abstracts on any particular subject can be located by first consulting the abridged tables of the U.D.C. published with the January number, or the Annual Alphabetical Subject Index, and then referring to the appropriate U.D.C. number in the text. The main headings are listed above.

An Abstract of interest under more than one head has additional U.D.C. numbers, linked by the colon sign, ":" e.g. "536.21 : 548.0 Conduction of heat in crystals." The Abstract is printed once only, under the main number, e.g. in the section "HEAT 536," but Cross-references are inserted under the other numbers, e.g. "548.0 : 536.21 *see Abstr.* 1234" in the section "CRYSTALLOGRAPHY 548." These Cross-references should be investigated, therefore, when a particular section is being searched, as they contain additional matter relevant to that section. A Cross-reference does *not* refer to the Abstract which appears immediately above it.

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NOTE ON THE UNIVERSAL DECIMAL CLASSIFICATION SYSTEM

The complete Tables of the 4th International Edition of the Universal Decimal Classification, used in *Science Abstracts*, are in process of publication by the British Standards Institution as B.S. 1000. The following brief notes, published with the permission of the Fédération Internationale de Documentation (F.I.D.) and of the B.S.I., may serve as a preliminary guide for readers.

The system is based on the conception of the whole of human knowledge as unity, divided into ten domains represented by decimal fractions:

.0	Generalities
.1	Philosophy
.2	Religion
.3	Social sciences
.4	Philology
.5	Pure science
.6	Applied science
.7	Art
.8	Literature
.9	History and geography

On this foundation the system is constructed on the principle of proceeding from the general to the more particular by continued subdivision of the numbers into decimal fractions.

Thus every concept within the domain of Pure Science is represented by a decimal fraction greater than .5 and less than .6, the first groups being

.50	General works on pure science
.51	Mathematics
.52	Astronomy
.53	Physics
.54	Chemistry. Crystallography
.55	Geophysics
.56	Palaeontology
.57	Biology
.58	Botany
.59	Zoology

For convenience the first decimal point is always omitted, but it is essential that it should remain imprinted on the reader's mind. The fact that all the numbers are in reality decimal fractions less than unity determines the arrangement of the numbers in numerical sequence. Thus 526 (meaning .526) precedes 53 (meaning .53) in ascending order.

To indicate a work dealing with two or more subjects independently, the numbers corresponding to these subjects are connected by + signs. Thus

531.754 + 536.62	Measurement of density and of specific heat

More important, and more widely used, is the symbol denoting some functional relation between two or more concepts, expressed by the respective numbers linked by the colon sign " : "

Thus

537.531	X-rays
535.4	Diffraction
548.0	Crystals
537.531 : 535.4 : 548.0	X-ray diffraction by crystals

Further symbols, for the use of which the reader is referred to B.S. 1000, Vol. 1, Part 1, may be used for indicating form, place, language, etc., e.g.

historical:	538.7(09)	Early geomagnetic instruments
place:	551.524.2(73	Temperature maps of the United States
language:	548.55 = 3	Monocrystalline tungsten wires (in German)

The arrangement in each monthly issue is numerical, according to the U.D.C. numbers. Cross-references, indicated by compound numbers linked by the colon symbol, are given in their proper places, according to each component number. Thus abstracts with compound indices such as

537.531 : 535.4 : 548.0	X-ray diffraction by crystals

are given under 537.531 X-rays, and quoted again under 535.4 Diffraction, and 548.0 Crystals, so that the subject of the abstract is indicated to the searcher in every one of the three fields.

The following abridged tables of the sections

51	Mathematics
52	Astronomy. Geodesy
53	Physics
54	Chemistry
55	Geology. Geophysics
57/59	Biological Sciences
61	Medical Sciences
66/68	Industrial Technology
77	Photography

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51 MATHEMATICS

511	**ARITHMETIC AND THEORY OF NUMBERS**
511.1	Numeration. Arithmetical operations
.11	Notation
.12	Addition, subtraction, multiplication and division of integers
.13	Factors. Fractions. Decimals. Percentages. Proportion
.14	Extraction of roots. Surds. Imaginaries
.15	Arithmetical use of logarithms
.16	Operations with concrete units
.2	General properties of numbers. Residues
.22	Congruences. Indeterminate analysis of the first degree
.23	Quadratic residues
.24	Complex numbers of the form $a + b\sqrt{-1}$
.28	Theory of prime numbers
.4	Forms. Systems of forms
.5	Indeterminate equations of order higher than the first
.6	Algebraic numbers
511.7	Theory of continued fractions
.8	Transcendental numbers
512	**ALGEBRA**
512.1	Elementary algebraic operations and formulae. Progressions
.14	Binomial formula. Powers of polynomials
.2	Equations and functions of the first and second degree
.3	Theory of equations. Polynomials
.4	Solution of equations by radicals
.5	Rational fractions. Interpolation
.8	Higher algebra
.83	Determinants. Matrices
.86	Linear substitutions. Groups See also 519.4 Theory of groups
.87	Elimination
.88	Invariants and covariants
.89	Theory of forms
.9	Universal algebra. Complex quantities. Vector algebra For differential vector operators see 517.43

513 GEOMETRY
513.0 Principles of geometry
.01 Axioms
.02 Analytical treatment
.03 Infinitesimal methods
.1/.2 Plane geometry
.11/.15 Triangles
.17 Anharmonic ratio. Homography. Harmonic division. Involution
.18 Quadrilaterals
.19 Polygons
.21/.28 Circles
513.3 Solid geometry
.31 Points, planes and straight lines
.34 Polyhedrons
.43 Right cylinder and cone
.44/.47 Spheres. Spherical geometry
.49 Geometrical constructions
.51/.55 Conics
.56/.58 Quadrics
.59 Quadric varieties
.61 Algebraic plane curves
.62 Algebraic surfaces
.63 Algebraic skew curves
.64 Transcendental curves and surfaces
.65 Algebraic twisted curves
.66/.67 Algebraic varieties of order greater than 2
.71 Complexes and congruences. Line geometry
.72 Connexes. Systems of curves, of surfaces and of varieties. Enumerative geometry
.73/.74 Infinitesimal geometry. Kinematic geometry. Trajectories
.75/.77 Transformations
.8 Various geometries
.81 Non-Euclidean geometry
.82 Multidimensional geometry
.83 Analysis situs. Topology

514 TRIGONOMETRY

515 DESCRIPTIVE GEOMETRY. PROJECTION. PERSPECTIVE

516 ANALYTICAL GEOMETRY. CO-ORDINATES

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.2 Differential calculus
517.26 Taylor's and Maclaurin's series
.3 Integral calculus
.4 Functional determinants. Differential forms. Differential and integral operators
517.5 General theory of functions
.512.2 Fourier series
.512.3 Series of Legendre polynomials
.512.4 Series of Bessel functions
.52 Infinite series. Convergence. Summation
.53 Analytic functions of a complex variable
.54 Conformal representation
.55 Functions of several complex variables
.56 Algebraic, circular, exponential, hyperbolic and other functions
.6 Definite integrals
.61 Gamma functions
.63 Laplace transformations
.7 Elliptic functions
.8 Hyperelliptic functions. Abelian functions. Fuchsians
.9 Differential, integral, functional and finite-difference equations
.949 Theory of finite differences

518 GRAPHS. METHODS OF CALCULATION. NOMOGRAPHY. TABLES. MATHEMATICAL GAMES AND RECREATIONS

519 COMBINATORY ANALYSIS. MATHEMATICAL STATISTICS. CALCULUS OF PROBABILITY. CALCULUS OF VARIATIONS. THEORY OF GROUPS. THEORY OF AGGREGATES
519.1 Combinatory analysis
.21 Calculus of probability
.24 Analysis of statistical data. Means. Standard deviation. Skewness
.25 Statistical regularity. Errors of observation. Probable values
.26 Qualitative observations. Contingencies
.27 Quantitative observations. Sampling. Correlation
519.3 Calculus of variation
.4 Theory of groups, fields and ideals
See also 512.86 Linear substitutions
.5 Theory of aggregates
.53 Theory of measure

52 ASTRONOMY. GEODESY

521 THEORETICAL ASTRONOMY
.03 Astrophysics
.04 Astrochemistry
.07 Astrobiology. Habitability of celestial bodies
See also 576.15
.1 Celestial mechanics
.12 Universal gravitation
.13 Problem of 3 bodies. Problem of *n* bodies
.14 Shape of celestial bodies
.15 Rotation of celestial bodies
521.2 Geocentric and heliocentric loci
.25/.29 Co-ordinates
.3 Determination of orbits
.4 Perturbations
.5 Orbital motion
.6 Orbital motion of satellites
.7 Theory of comets
.8 Theory of eclipses, occultations and transits
.9 Theory of aberration, precession and nutations

522 PRACTICAL ASTRONOMY
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.2 Telescopes
.3 Meridian instruments. Meridian circles
.4 Observation instruments other than meridional
522.5/.6 Auxiliary instruments and apparatus
.7 Spherical astronomy
.9 Sources of error and corrections

523 CELESTIAL BODIES (except Earth)
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.28 Orreries. Planetaria
.29 Zodiac
.3 The Moon
.4 Planets and their satellites
.5 Meteors. Zodiacal light
.6 Comets
.7 The Sun
523.8 Stars
.81 Position. Parallax. Distance
.82 Magnitude. Colour. Visibility
.83 Proper motion. Rotation
.84 Variable stars. Binaries. Novae
.85 Clusters. Nebulae. Milky Way
.87 Spectra
.877 Physical and chemical constitution of stars
.88 Constellations
.89 Catalogues
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.9 Transits. Occultations

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.13 Dimensions
.14 Shape of the Earth
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.15 Solar distance. Solar parallax
.2 Physics of the Earth from the astronomical point of view. Cosmic influences
See also
550.3 Geophysics
551.5 Meteorology
.3 Orbit and rotation
.4 Geographical co-ordinates
See also
527 Nautical astronomy
526 Geodesy
.5 Seasons
.6 Tides
.7 Terrestrial atmosphere
See also 551.5 Meteorology

526 GEODESY. SURVEYING
526(4/9) Geodetic surveys and reports of different regions
526.1 Theory and determination of the shape of the Earth
.2 Base measurement and apparatus
.3 Geodetic triangulation and levelling
.4/.5 Triangulation calculation
.6 Astronomical determination of geographical co-ordinates
.7 Gravity measurements
.7(4/9) Gravity surveys of different regions
.8 Cartography. Maps and models
.9 Topographical surveying and levelling
.9(4/9) Topographical survey of different regions

527 NAVIGATION. NAUTICAL ASTRONOMY

529 CHRONOLOGY. MEASUREMENT OF TIME
.1 Sidereal day and solar day
.2 Eras. Years. Months. Weeks
.3/.5 Calendars
.7 Horology. Measurement of time
Clocks and watches see 681.11

53 PHYSICS

Special Analytical Subdivisions

In the section 53 Physics, special analytical subdivisions can be used where no appropriate main subdivisions exist, as follows:—

.01 Theory and nature of the phenomenon
.02 General laws
.03 Production and causes of the phenomenon
.04 Effects
.06 Application
.07 Apparatus
.08 Measurements
.081 Units. Constants. Dimensions
.082/.083 Principles and methods of measurement
.084/.087 Instruments and apparatus. Recording
.088 Errors and corrections

530.1 GENERAL PRINCIPLES
.112 The ether
.12 Relativity
.145 Quantum theory
.145.6 Wave mechanics
.15 Action and reaction. Hysteresis
.16 Causality and probability

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531 GENERAL MECHANICS. MECHANICS OF SOLID AND RIGID BODIES
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531.1 Kinematics. Geometry of motion
.14 Translation. Sliding
.15 Rotation
.18 Relative motion
.19 Statistical mechanics
531.2 Statics. Forces. Masses. Equilibrium
.22 Composition and resolution of forces
.23 Moments
.24 Centre of gravity
.25 Graphical and analytical statics
.26 Attraction. Potential
531.3 Dynamics
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.312 D'Alembert's principle
.313 Virtual velocities
.314 Least action
.33 Tautochronism. Isochronism
See also 531.53 Pendulum
.35 Central forces
.36/.38 Motion of solid bodies. Rigid dynamics. Stability
.39 Special problems of dynamics
.4 Work. Friction

531.5 Weight. Gravitation. Ballistics
.51 Laws of universal attraction
.51 : 530.12 Relativity theory of universal attraction
.52 Falling bodies
.53 Pendulum theory
.55/.57 Motion of projectiles
.6 Mechanical energy. Momentum. Impact
531.7 Measurement of geometric and mechanical quantities
.71 Length
.72 Surface
.73 Volume
.74 Angles
.75 Mass. Density
.76 Time. Velocity. Acceleration
.77 Angular velocities
.78 Force. Work. Pressure
.8 Theory of machines

532 MECHANICS OF FLUIDS. HYDROSTATICS. HYDRODYNAMICS
.1 Hydrostatics in general
.12 Elasticity. Compressibility
.13 Viscosity
.14 Density
.2 Equilibrium of liquids
.3 Equilibrium of immersed and floating bodies
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.52 Conditions of motion
.522 Orifices
.525 Nozzles. Jets
.527 Vortices
.528 Cavitation
.53 Weirs. Waterfalls
.54 Pipes. Siphons. Canals. Rivers
.55 Energy losses
.57 Hydrometry
.58 Pressure exerted by a liquid in motion. Motion of submerged and floating bodies
.59 Wave motion
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.61 Surface tension
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.63 Capillarity
.64 Angle of contact
.69 Surface activity. Oiliness. Wetting
.7 Kinetic theory of liquids. Osmosis. Solution
.71 Osmosis
.72 Diffusion
.73 Solution
.74 Association

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.78 Crystallization. Supersaturation
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.12 Density
.15 Diffusion
.16 Viscosity
533.2 Elasticity. Compressibility. Liquefaction. Gas mixtures
.22 Boyle's law
.24 Liquefaction
.275 Humidity. Hygrometry
.4 Barometers
.5 Rarefied gases. Vacuum technique
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.01 Theory
.011 Motion of the air
.013/.015 Dynamics of aircraft
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533.61/.64 Theory of balloons, kites and airships
.65/.69 Theory of aircraft and aircraft elements
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.22 Velocity of propagation
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.24 Reflection
.25 Refraction
.26 Diffraction
.27 Polarization
.32 Quality. Pitch. Timbre
.321.8 Infrasonic vibrations
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.87 Acoustic signalling
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.23 Energy of radiation. Black-body radiation
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.313 Curved mirrors. Aberration
.314 Refraction
.315 Prisms
.316 Thin lenses
.317 Thick lenses
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535.33 Spectra in general. Emission spectra
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.33 Structure of lines
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.342/.343 Absorption spectra
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.55 Double refraction produced by strain
.56 Optical rotation
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535.6 Colour
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.24 Charge on small particles

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537.5 **Electric discharges. Radiations**
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.53 Radiation
537.531 X-rays
Propagation, reflection, refraction, etc., are classified by colon combination with the appropriate sections of 535
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.13 Intramolecular mechanics. Quantum theory of molecules
.132 Molecular dimensions. Moments
.133 Structure of atoms
.15 Nucleus. Quantum theory of nucleus
.152.1 Distribution of electrons. Quantum theory of the atom
.153 Atomic constants. Nuclear charge. Moments
.154 Atomic weight
.155 Isotopes
.2 Number of molecules in gram-molecule
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539.17 Rays of uncharged particles
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.216 Schistosity. Lamellar structure. Fibres
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.6	Chemical structure
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.64	Polymerism
541.65/.69	Relation between chemical structure and physical properties
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.9	Chemical processes
543/545	**ANALYTICAL CHEMISTRY**
546	**INORGANIC CHEMISTRY**
547	**ORGANIC CHEMISTRY**
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.7	Molecular structure of crystals
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.74	Electron diffraction
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MATHEMATICS 51

7 1

ltivectors and catalytic tensors. RUSE, H. S. *Phil.* , **38,** 408–21 (*June*, 1947).

3 2

me applications of contour integration. MACROBERT, *Phil. Mag.*, **38,** 45–51 (*Jan.*, 1947).—The analytical nuation of the hypergeometric function is discussed n formula for the associated Legendre functions of econd kind is established. An asymptotic expansion of Kummer's function is obtained, and Fourier's integral theorem is derived. L. S. G.

519.4 = 4 3

Contribution to the theory of the infinitesimal transformations of spinors. DE DONDER, T., AND VAN ISAKER, J. *Bull. Acad. Belge Cl. Sci.*, 33 (*Sér.* 5) 280–7 (*July*, 1947) *In French.*—In this continuation of previous work [Abstr. 3005 (1947)] an extension of the definition of a vector is used to generalize spinors to include non-Euclidean metrics. G. J. K.

ASTRONOMY . ASTROPHYSICS . GEODESY 52

: 535.33.072–15 4

infra-red stellar spectrometer. KUIPER, G. P., ON, W., AND CASHMAN, R. J. *Astrophys. J.*, **106,** 50 (*Sept.*, 1947).—A stellar spectrometer which was for the interval $\frac{3}{4}$–3 μ is described. The receiver is ently developed PbS cell, and the amplifier system designed for the purpose. Sample spectral records eproduced. A.

15 : 535.243 : 523.75 = 4 5

oto-electric photometry with the spectrohelioscope. , F. *C.R. Acad. Sci., Paris*, **225,** 562–3 (*Oct.* 6, 1947) *ench.*—Describes apparatus applied to the spectroscope at Ondrejov, Czechoslovakia, to enable ures to be made on chromospheric eruptions during hole of their short existence. The apparatus includes table electron multiplier and oscillograph. E. G. M.

1 : 530.12 6

interpretation of light and its bearing on cosmology. AR, M. J. S. *Phil. Mag.*, **38,** 488–94 (*July*, 1947).— ssay in which it is contended that all known physical omena, including various relativity effects, may be ained in a Newtonian universe with universal time. troscopic binary stars and the extragalactic nebulae mong the topics discussed. L. S. G.

11 : 531.51 : 530.12 = 4 *see Abstr.* 25

7

fra-red spectra of planets. KUIPER, G. P. *Astrophys.* **06,** 251–4 (*Sept.*, 1947).—Infra-red spectra of Venus, er and Saturn are shown, obtained with a PbS A.

75 : 523.877 8

odel solar atmospheres. MÜNCH, G. *Astrophys. J.*, 217–23 (*Sept.*, 1947).—Recent determinations of the inuous absorption coefficients of H^- [Abstr. 1414 7)] are used to revise Strömgren's calculations of ., pressure and opacity in model atmospheres [see r. 1117 (1947)]. Results are tabulated for optical hs from 0·01 to 1·4; the pressures are lower, and the ities higher than Strömgren's values. R. A. N.

75 : 535.243 : 522.615 = 4 *see Abstr.* 5

77 9

e solar curve of growth for lines of VI. KING, R. B., WRIGHT, K. O. *Astrophys. J.*, **106,** 224–30 (*Sept.*,).—Equivalent widths from the revised Rowland's , the Utrecht photometric atlas and Allen's values used with lab. *gf* values. The resulting excitation perature (5 400°) is higher than that from Ti I or Fe II, turbulence increases with decreasing excitation ntial as in *F*-type stars. D. L. E.

77 : 535.33–15 10

ew atomic lines in the infra-red solar spectrum. MATH, R. R., ADEL, A., GOLDBERG, L., AND MOHLER, O. C. *Phys. Rev.*, **72,** 644–5 (*Oct.* 1, 1947).—Many of the measured lines in the solar spectrum between 1 and 2 μ have been identified with infra-red lines of Fe I, Si I, C I, Ti I, and V I spectra. W. E. D.

523.8 : 537.212 11

Stellar electromagnetic fields. DAVIS, L., JR. *Phys. Rev.*, **72,** 632–3 (*Oct.* 1, 1947).—It is suggested that magnetized rotating stars will be surrounded by electrostatic fields in which the potential differences are $\sim 10^9$ to 10^{14} V. Space charge effects are discussed, and it is suggested that purely dipole magnetic fields will not exist. R. A. N.

523.821.5 : 523.854.3 12

Six color photometry of stars. V. Infra-red radiation from the region of the galactic center. STEBBINS, J., AND WHITFORD, A. E. *Astrophys. J.*, **106,** 235–42 (*Sept.*, 1947).—Describes measures of the intensity of radiation over a region from galactic longitude 321° to 331° and up to 2° on each side of the galactic equator. The photocell and filter, effective wavelength 10 300 Å, were carried on the 60-in reflector, and recordings were made by allowing the sky to drift past. It is suspected that the galactic centre is located and its general outline plotted, but further work is necessary. E. G. M.

523.84 : 523.877 = 4 *see Abstr.* 20

523.852.32 : 530.12 13

The equation to the arm of a spiral nebula. MILNE, E. A. *Astrophys. J.*, **106,** 137–42 (*Sept.*, 1947).—Circular Keplerian orbits of galactic particles in Newtonian τ-time become equiangular spirals in the t-time of kinematical relativity [see Abstr. 3031 (1947)]. The equation representing the arm of a nebula (regarded as the locus of the present positions of a set of particles describing such orbits) is deduced, restricting the discussion to particles which have passed through a fixed point in t-measure near the nucleus. The equation depends on the epoch t reckoned from the natural zero of time, and its relation to the orbital equation for the individual particles is exhibited. It represents closely the most general form of spiral arm to be expected. A. HU.

523.854 : 537.591.5 *see Abstr.* 151

523.854.3 : 523.821.5 *see Abstr.* 12

523.872 : 535.51 14

On the presence of polarization in the continuous radiation of early-type stars. HILTNER, W. A. *Astrophys. J.*, **106,** 231–4 (*Sept.*, 1947).—Observations of the eclipsing binary RY Persei with a Wollaston prism at two different position angles suggests changes of polarization with phase, of the order (0·015 mag.) required by Chandrasekhar's prediction on the law of darkening. More accurate technique is required for full confirmation. D. L. E.

523.877 15

A note on the minimum radius for degenerate stellar masses. AULUCK, F. C., AND KOTHARI, D. S. *Phil. Mag.*, **38**, 368–70 (*May*, 1947).—A relativistic correction is applied to a result obtained previously [Abstr. 1223 (1945)]. L. S. G.

523.877 16

On the radiative equilibrium of a stellar atmosphere. XIX. CHANDRASEKHAR, S., AND BREEN, F. H. *Astrophys. J.*, **106**, 143–4 (*Sept.*, 1947).—The tabulation of *H*-functions is continued. [See Abstr. 2397 (1949)]. R. A. N.

523.877 17

On the radiative equilibrium of a stellar atmosphere. XX. CHANDRASEKHAR, S. *Astrophys. J.*, **106**, 145–51 (*Sept.*, 1947).—Methods developed in paper XIV [Abstr. 1419 (1947)] are used to obtain an exact solution of the problem of line formation, allowing for the combined effects of line scattering and general continuous absorption. It is assumed that the ratio σ_ν/κ_ν of the line and continuous absorption coefficients is constant through the atmosphere, and that the Planck intensity is a linear function of optical thickness. R. A. N.

523.877 18

On the radiative equilibrium of a stellar atmosphere. XXI. CHANDRASEKHAR, S. *Astrophys. J.*, **106**, 152–216 (*Sept.*, 1947).—See Abstr. 1419 (1947). The theory of the diffuse reflection and transmission by a plane-parallel atmosphere of finite optical thickness is reconsidered. Various scattering conditions are discussed, includi Rayleigh scattering with allowance for polarization; it found possible to eliminate all constants of integratio and to express solutions in terms of a pair of functio $X(\mu)$ and $Y(\mu)$, which play the same role in the prese theory as do the *H*-functions in the theory of semi- atmospheres. R. A.

523.877 = 4

On the constancy of the integrated flux in stellar atm spheres and the solution of the equation of transf KOURGANOFF, V. *C.R. Acad. Sci., Paris*, **225**, 491 (*Sept.* 22, 1947) *In French.*—The rate of emission *B* in t atmosphere is expressed as a function of depth, τ, i volving arbitrary coefficients which are to be evaluat by minimizing the square deviation from constancy the integrated flux. When *B* is a linear function of τ, t method gives a temp. distribution in close agreement wi Milne's first approximation. R. A.

523.877 : 523.75 *see Abstr.* 8

523.877 : 523.84 = 4

Stellar interiors. Origin of stellar energy. Variab stars. COUDERC, P. *Rev. Sci., Paris*, **85**, 289–3 (*March* 1 *and* 15, 1947) *In French.*—A general review the theory of stellar structure. The survey covers pol tropic and radiative equilibrium, radioactivity a nuclear reactions, cepheid pulsation, novae a supernovae. R. A.

PHYSICS 53

FUNDAMENTALS 530.1

530.12 21

Symmetric energy-momentum tensors in relativistic field theories. DE WET, J. S. *Proc. Camb. Phil. Soc.*, **43** (*Pt* 4) 511–20 (1947).—The symmetric tensor, in the form derived by Born for vector fields, is valid for Lagrangians which are functions of tensor fields and their first derivatives. A simple form of the same type is obtained when the Lagrangian contains higher derivatives of any order. By the same method the tensor due to Belinfante, when spinor fields and their first derivatives are included in the Lagrangian, is extended to allow for the presence of higher derivatives. G. J. K.

530.12 22

Kinematical relativity. LEWIS, T. *Phil. Mag.*, **38**, 602–6 (*Aug.*, 1947).—A discussion of Band's recent criticism [Abstr. 1716 (1947)] of the axiomatic basis of Milne's theory, and Milne's transformation theory. L. S. G.

530.12 : 523.11 *see Abstr.* 6

530.12 : 523.852.32 *see Abstr.* 13

530.12 : 530.145.6 23

Force as a fictitious idea. SOH, H.-P. *Phil. Mag.*, **38**, 606–8 (*Aug.*, 1947).—When a proper equation is found the forms of various forces must come out as the necessary consequences of the equation. This is considered in continuing previous work [Abstr. 2472, 2350 (1946)] and an equation of the 5th degree is obtained for Schrödinger's wave function. L. S. G.

530.12 : 531.51 24

The relation between metric and affinity. SCHRÖDINGER, E. *Proc. R. Irish Acad.*, **51A**, 147–50 (*June*, 1947).—In 1918 Weyl pointed out that the relativistic theory of gravitation is based not on a metric but on an affine connection related to it. Of all possible affinities this one must be physically compatible with the metric. It is shown that the variational principle used by Einstein in 1915 to develop his field equations is powerful enough to select uniquely the Christoffel-affinity from all symmet affinities. L. S.

530.12 : 531.51 : 523.11 = 4

Note on a new solution of the relativistic gravitatio equations and its cosmological consequences. VESCA T.-T. *C.R. Acad. Sci., Paris*, **225**, 278–82 (*Aug.* 4, 194 *In French.*—Einstein's gravitational equations are solv for a metric

$$ds^2 = dt^2 - \frac{R^2(t)}{c^2}\,\frac{dx^2 + dy^2 + dz^2}{\{1 + \frac{1}{4}(x^2 + y^2 + z^2)\}^2}$$

under the assumptions that the total mass, *M*, of t universe is being lost according to the law $M = M_0 - M_1 e^{-qt}$ and that the pressure of radiation, *P*, is varyi according to $P = P_0(e^{rt} - 1)$, where q, r, M_0, M_1, P_0 are constants. It is not explained what happens to t lost mass. The radius $R(t)$ of space is shown to $\to$ a con limit as $t \to \infty$. The attainment of this limit ma however, not be possible as, before it is reached, t increase of *P* may produce a reversal of the process expansion and the system may begin to contract. G. C. Mc

530.12 : 531.51 : 538.3

The final affine field laws. I. SCHRÖDINGER, E. *Pro R. Irish Acad.*, **51A** (*No.* 13) 163–71 (*May*, 1947). The differential field equations of a unified field theory gravitation and electromagnetism are obtained by assu ing that a 4-dimensional space-time which has an asy metric affine connection of coefficients Γ^l_{kl} and by usi the Hamiltonian variational principle

$$\delta\int_\lambda^2(-|R_{\mu\nu}|)^{\frac{1}{2}}d\tau = 0$$

where λ is a non-zero constant and the $R_{\mu\nu}$ are defined

$$-\frac{\partial\Gamma^\sigma_{\mu\nu}}{\partial x_\sigma} + \frac{\partial\Gamma^\sigma_{\mu\sigma}}{\partial x_\nu} + \Gamma^\sigma_{\mu\kappa}\Gamma^\kappa_{\sigma\nu} - \Gamma^\sigma_{\rho\sigma}\Gamma^\rho_{\mu\nu}$$

st integral of the resulting field equations can be
t. The author expresses his belief that his field
ions ought to show that every large rotating body
d have a magnetic field but does not demonstrate
y working out the relevant solution of his equations.
is there any evidence provided that the new field
ions lead to any observational result which is not
ly accounted for by Maxwell's equations on the one
and Einstein's original gravitational equations on
ther. G. C. McV.

4 27

the representation of the wave function of a quantized by means of a generating function. PENG, H. W. *R. Irish Acad.*, **51A** 113–22 (*March*, 1947).—field theory of particles obeying Fermi or Bose-tics a wave-function can be derived by the equation $F\psi_0$, where F is a suitable q-number and ψ_0 is the function with zero particles. The generating on F can be used for many purposes more easily the wave-function Ψ. This is an extension of a sentation due to Dirac [Abstr. 353 (1944)]. G. J. K.

4 28

lculation of the interaction between two particles from symptotic phase. FRÖBERG, C.-E. *Phys. Rev.*, **72**, 0 (*Sept.* 15, 1947).—It is shown that it is formally ble to calculate the potential function from the ptotic phase. W. E. D.

4 29

neralised algebra of elementary particles. MADHAVA B. S. *Proc. Indian Acad. Sci. A*, **26**, 221–33 (*Oct.*, .—The algebra of any number of β-matrices with ommutation rules of meson β-matrices is discussed ning that they are associated with particles of spin $n + \frac{1}{2}$). Only properties of the real orthogonal group sed. G. J. K.

4 = 3 30

the false zero eigen-values of the *S*-matrix. JOST, R. *Phys. Acta*, **20** (*No* 3) 256–66 (1947) *In German.*—wo-body problem is discussed using the *S*-matrix. rigin of the false zeros is traced in detail for simple ential potentials and for sums of such functions, analytically for a fairly general potential with a le asymptotic behaviour. A potential of the last which is zero outside a certain range does not give any false zeros. G. J. K.

4 = 4 31

ne applications of the theory of groups of unitary ormations in the calculus of probabilities and quan-nechanics. ARNOUS, E. *Rev. Sci., Paris*, **85**, 553–8 15, 1947) *In French.*—The systematic use of unitary s in a suitable Hilbert space makes it possible to quickly the essential results in the theory of nary wave functions and in quantum mechanics. A.

4 : 537.122 = 3 *see Abstr.* 118

4 : 538.31 : 537.122 32

e interaction of electrons and an electromagnetic ELIEZER, C. J. *Rev. Mod. Phys.*, **19**, 147–85 (*July*, .—The divergent integrals which appear in inter-n calculations are discussed both in classical and in tum theory. Using Dirac's method, various ative forms of the classical equations of motion of ot electron are derived, and then applied to simple lectron problems. These alternatives include the rence of higher derivatives of the velocity than the d in the equations, and various combinations $_{v} + bF_{ret.}$) of the advanced and retarded potentials in the electromagnetic field due to the electron. The conclusion is that the combination $a = b$ is the best, although this eliminates radiation damping. The Lorentz–Dirac equations for $a \geqslant b$ have the advantage of giving physically admissible solutions. The quantum formulation of the ordinary Lorentz–Dirac equation is then given with the λ-limiting process. By means of this the interaction of an electron with a radiation field is carried to higher order approximation. The general solution involves divergent integrals, but a particular solution representing outgoing waves of the electron is free from divergences to all approximations. G. J. K.

530.14 : 539.152.1 33

Energy in the nuclear field. FLINT, H. T. *Phil. Mag.*, **38**, 22–32 (*Jan.*, 1947).—An extension of previous work [Abstr. 2035 (1945)] in which the elementary particle in the nucleus is represented by a first order equation differing from the Dirac equation for the electron. The theory of the scalar nuclear field is developed and the character of the infinities which arise in energy expressions is discussed. L. S. G.

530.145 34

On the particle aspect of the general mixed meson theory. ERIKSSON, H. A. S. *Ark. Mat. Astr. Fys.*, **34A** (*No.* 21) 15 *pp.* (1947).—The field equations of a charged mixed meson theory involving all four types of mesons can be written as a set of 4 Dirac equations with a spin angular momentum matrix similar to that of an electron. The corresponding neutral field is described by a set of two Dirac equations. G. J. K.

530.145 35

On an interpretation of the quantum. HOUSTOUN, R. A. *Phil. Mag.*, **38**, 479–88 (*July*, 1947).—An attempt is made to explain why a particular quantity of energy is connected with a particular frequency. It is suggested that the emission of light is due to a reversal of spin in the electron. The picture is that of spinning particles which reverse occasionally at impacts and change kinetic energy into radiation. The following are considered from this point of view: (1) the Zeeman effect, (2) impact of an electron on a positron, (3) electron diffraction, (4) Planck's law of radiation. L. S. G.

530.145 = 4 36

On wave equations of the second order for particles of spin $\frac{1}{2}\hbar$ in external fields. PETIAU, G. *J. Phys. Radium* (*Sér.* 8) **8**, 134–9 (*May*, 1947) *In French.*—The wave equation is determined from the Dirac equation of the electron, with the most general interaction included. Interaction with the electromagnetic field or any type of meson field then appears as a special case. The equations make clear the types of term to appear in the interaction potential. G. J. K.

530.145 = 4 37

On the equations of particles of spin (3/2) and their second quantisation. VAN ISAKER, J. *Bull. Acad. Belge Cl. Sci.*, **33** (*Sér.* 5) 262–7 (*June*, 1947) *In French.*—A variation method is used to obtain the field equations and the commutation relations are obtained by a method due to Géhéniau. Quantization is different for the two masses of the particle described by the equations. G. J. K.

530.145 : 539.18 *see Abstr.* 190

530.145 : 539.18 = 4 38

Changes in the spin and proper mass of a meson. GEHENIAU, J. *Bull. Acad. Belge Cl. Sci.*, **33** (*Sér.* 5) 268–74 (*June*, 1947) *In French.*—The cross-sections for

transformations of vector mesons into pseudoscalar mesons are discussed using the reducible representation of degree 16 and a special interaction term. G. J. K.

530.145.6 = 4 39

On the frequency and phase velocity of monochromatic waves in wave mechanics. DE BROGLIE, L. *C.R. Acad. Sci., Paris*, **225**, 361–3 (*Aug.* 25, 1947) *In French.*—In wave mechanics only the wavelength and the group velocity are observable quantities. It is shown that the frequency and phase velocity can be correctly determined from them, using relativistic invariance. G. J. K.

530.145.6 : 530.12 *see Abstr.* 23

GENERAL MECHANICS MECHANICS OF SOLIDS 531

531.19 = 3 40

On Bose statistics (Addendum). SCHUBERT, G. *Z. Naturforsch.*, **2a**, 250–1 (*May*, 1947) *In German.*—A correction is added to the distribution function to terms of order $(1/N)$, previously obtained [Abstr. 3068 (1946)] for an ideal Einstein–Bose gas of N particles. G. J. K.

531.19 = 4 41

The conservation of energy and momentum in statistical mechanics. BETCHOV, R. *Arch. Sci. Phys. Nat.*, **29**, 5–41 (*Jan.–Feb.*, 1947) *In French.*—Various methods of defining and calculating the thermodynamic functions are distinguished by the degree to which they satisfy the conservation laws. It is verified that they give the same limiting values as the number of particles $N \to \infty$, whilst giving different results for N finite. Modifications due to quantum mechanics are discussed. G. J. K.

531.224 42

Mathematical theory of deflection of beam. FREEMAN, J. G. *Phil. Mag.*, **37**, 855–62 (*Dec.*, 1946).—A light straight beam supported on 2 smooth supports is subjected to a normal force at the midpoint. The relation between the force, the span and the deflection is determined, in the case when the deflection is not necessarily $\ll$ the span. The results are verified experimentally. L. S. G.

531.259 : 539.4.013 : 536.413 43

The effect of shape on the thermal endurance of cylindrical glass containers. MURGATROYD, J. B. *Phil. Mag.*, **38**, 549–63 (*Aug.*, 1947).—The effects of shape on the stress systems set up by thermal gradients are investigated, 5 cases being discussed: (1) hollow cylinders with thin wall, (2) thick-walled cylinders, (3) solid cylinders, (4) open end of hollow cylinders, (5) closed end of hollow cylinders. Experimental tests are described. The results compare favourably with the theory. L. S. G.

531.391 : 534.015 *see Abstr.* 63

531.51 : 523.11 : 530.12 = 4 *see Abstr.* 25

531.51 : 530.12 *see Abstr.* 24

531.51 : 538.3 : 530.12 *see Abstr.* 26

MECHANICAL MEASUREMENTS 531.7

531.714.7 : 621.317.39 44

Cathode-ray recording micrometer and force gauge. EWLES, J., AND CURRY, C. *J. Sci. Instrum.*, **24**, 261–5 (*Oct.*, 1947).—[Abstr. 97 B (1948)].

531.787.088.22 : 532.1 45

Calculation of the error due to leakage in the hydraulic ram method of pressure-calibration. BREMNER, J. W. *Phil. Mag.*, **38**, 564–73 (*Aug.*, 1947).—The error, for a cylindrical ram, is expressed as a simple function of t radii of the ram and the cylinder, and $\simeq \frac{1}{2}\%$ only. T formula was confirmed experimentally. L. S.

MECHANICS OF LIQUIDS 532

532.1 : 531.787.088.22 *see Abstr.* 45

532.13 : 532.7

An interpretation of the sigma phenomenon. BOSWOR R. C. L. *Phil. Mag.*, **38**, 592–601 (*Aug.*, 1947).— theory of anomalous viscosity (the "σ phenomenon") developed. The viscosity of the liquid varies with t radius of the containing vessel; it is suggested that th is evidence for a slip at the walls analogous to th occurring in the low pressure molecular flow of gas due to the transport of momentum by a carrier passi to the wall without making a collision. Suitable carri of momentum in the case of 2-phase systems show the σ-phenomenon may be found in the acousti vibrations into which the Debye theory resolves t thermal molecular energy. L. S.

532.133 : 536.48 = 3

Determination of the viscosity of liquid hydrogen a deuterium. VAN ITTERBEEK, A., AND VAN PAEMEL, *Physica, 's Grav.*, **8**, 133–43 (*Jan.*, 1941) *In Germa* Measurements of the viscosity of liquid H (14·7(20·37°K), D (18·74°–23·65°K) and O (68·70°–90·25° by the oscillating disc method. It was found that t viscosity η can b related to the density ρ by the expressi $1/\eta = a + b\rho$ where a and b are independent of tempe ture. a is approx. $\propto$ 1/(mol. weight). This relation a holds for CO, N_2, C_2H_6, for which data are given the literature. H.

532.133 : 532.7 : 536.48

Some remarks concerning the viscosity of liquid hydro and deuterium in connection with the theory of Ew Eyring. VAN ITTERBEEK, A., AND VAN PAEMEL, *Physica, 's Grav.*, **8**, 522–4 (*June*, 1941).—The relati between viscosity and density given in the previc abstract has no physical significance because t range of viscosities covered is not sufficient t establishing a linear relationship. Attention is dra to a formula of Ewell and Eyring [Abstr. 43 (1937)]: $\eta = 1{\cdot}09 \cdot 10^{-3} M^{\frac{1}{2}} T^{\frac{1}{2}} e^{E_a/RT}/(V^{\frac{2}{3}} E_v)$ based the "hole" theory of liquids, M = molecular weig V = molecular volume, E_a = activitation energy for t formation of holes of the size of the molecule, E_v = lat heat of evaporation. Ewell and Eyring give figures E_v/E_a which do not agree with the authors' measureme on H_2 and D_2. By assuming instead $E_a = \int_V^{2V} a/v^2$ where a is the van der Waals constant, the authors able to obtain fair agreement for liquid hydrogen an number of other liquids. H.

532.517.4 = 82

Diffusion of turbulent pairs. SRETENSKI, L. N. *B Acad. Sci. URSS. Dep. Sci. Tech.* (*No.* 3) 271–300 (19 *In Russian.*—An examination is made of the propagati of turbulent motion in a viscous liquid under the acti of two turbulent zones of opposite intensity and sy metrical with reference to the horizontal plane. solution is attempted on the basis of approximation a two common postulates. From the energy equation o viscous liquid, a linear equation is developed describi the conditions of flow. The analytic solution is demo strated by two examples dealing with movement a diffusion around a circular shaft, and the propagation

x movement in a damping liquid from two vortex possessing at the commencement a motion around most uniform vector vortex. The path of the zone ss is investigated, together with the kinetic energy urbulence as a function of time and initial con- ns. R. M.

25 = 5 50

w investigations on the spread of a liquid jet in a nary liquid. CITRINI, D. *Energia Elett.*, **24,** 177–92 , 1947) *In Italian.*—Previous investigations [*Energia* , **23,** 133–44 (*April*); 302–15 (*Aug.*, 1946)] are briefly ved. Velocity measurements with Pitot tube at us points of the jet issuing from a 34 mm dia. ontal tube under pressures varying between 30 and water show that the characteristic of velocity bution in the transverse sections is not in accord the theory based on efflux from a point source. velocity decreases exponentially, the cross-section jet increases parabolically. Apparatus is described, rocedure is discussed and the results are exhibited bles and graphs showing max. velocities, character- of distribution, transverse dimensions, for various ures. The conclusions are discussed in great detail. J. A. W.

94 : 535.312 *see Abstr.* 79

CAPILLARITY 532.6

1 : 536.7 : 541.183 51

qualitative demonstration of Gibbs surface tension on. NIEUWENHUIS, K. J. *Rec. Trav. Chim. Pays-66,* 454–70 (*July–Aug.*, 1947).—The demonstration instructional purposes. A fictitious process which ices 1 cm² of the surface of the solution is devised; sists of two steps and is applicable to both positive egative adsorption. S. J. G.

KINETIC THEORY OF LIQUIDS 532.7

: 532.13 *see Abstr.* 46

: 536.48 : 532.133 *see Abstr.* 48

MECHANICS OF GASES 533

3 : 533.275.08 : 533.7 52

theoretical basis for the diffusion hygrometer. ER-GREGORY, H., AND ROURKE, E. *Phil. Mag.*, 73–80 (*Aug.*, 1947).—Knudsen's law of molecular ning, as applied to the flow of gas through clay when the average pressure of the streaming gas tm., was tested experimentally. The agreement tisfactory and allows the theory of the hygrometer developed. L. S. G.

5 : 533.7 *see Abstr.* 61

5 : 533.7 = 3 53

the thermal diffusion of gases. WEBER, S. *Physica*, v., **8,** 1113–22 (*Dec.*, 1941) *In German.*—Calculation e exponent S in the law of repulsion $r^{-S_{12}}$ by a la derived from Chapman's theory for the case of e mass ratio of the two molecules 1 and 2. If λ_1 λ_2 denote the relative concentrations of the two ules ($\lambda_1 + \lambda_2 = 1$) the author obtains from lly selected experimental data for A(1) – He(2): 9·6 and 9·5 and for CO_2(1) – H_2(2): $S_{12} = 7{\cdot}9$ ·6; the first figure refers in each case to $\lambda_2 \to 0$ and cond to $\lambda_1' \to 0$. H. L.

533.15 : 536.48 54

Measurements on the thermomolecular pressure difference for hydrogen and deuterium gas at low temperatures. VAN ITTERBEEK, A., AND DE GRANDE, E. *Physica, 's Grav.*, **13,** 289–304 (*Aug.*, 1947).—At liquid H temps. H_2 has a higher thermomolecular pressure difference than D_2. This is due to an increase in the ratio of the mean free paths. H. L.

533.15 : 536.45 55

Measurements on the thermal molecular pressure difference in gases (H_2, D_2, He and Ne) at elevated temperatures. VAN ITTERBEEK, A., AND DE GRANDE, E. *Physica, 's Grav.*, **13,** 422–8 (*Aug.*, 1947).—Extension of measurements [Abstr. 54 (1948)] to 309°C. There is still a difference in the thermomolecular pressure differences of H_2 and D_2. H. L.

533.15 : 536.7 = 4 56

The thermodynamical efficiency of thermal diffusion. PRIGOGINE, I. *Physica, 's Grav.*, **13,** 319–20 (*Aug.*, 1947) *In French.*—A new definition which is considered more satisfactory than that given by Onsager [*Phys. Rev.*, **55,** 1137 (1939)]. H. L.

533.15 : 539.155.2 57

The thermal diffusion constant of helium and the separation of He^3 by thermal diffusion. MCINTEER, B. B., ALDRICH, L. T., AND NIER, A. O. *Phys. Rev.*, **72,** 510–11 (*Sept.* 15, 1947).—Well He was enriched in He^3 by thermal diffusion and a mass-spectrometer analysis of the resulting mixture gave a value of $0{\cdot}059 \pm 0{\cdot}005$ for the thermal diffusion constant; this is lower than assumed by Jones and Furry [Abstr. 1273 (1947)]. W. E. D.

533.24 : 536.48 = 4 58

Experimental determination of the yield of liquefaction of helium by the expansion method. VAN ITTERBEEK, A., VAN PAEMEL, O., AND MARIENS, P. *Physica, 's Grav.*, **10,** 90–6 (*Jan.–Feb.*, 1943) *In French.*—These measurements were carried out in an apparatus specially designed for the purpose and give a yield somewhat higher than Simon's [*Proc. Roy. Inst.*, **22,** 524 (1935)]. H. L.

533.275.08 : 533.7 : 533.15 *see Abstr.* 52

533.51 = 3 59

Gas-ballast pumps. GAEDE, W. *Z. Naturforsch.*, **2a,** 233–8 (*April*, 1947) *In German.*—The operation of a "Gaede" type of mechanical backing pump, so modified that additional air, called "gas ballast," can be introduced into the compression stage to avoid condensation when exhausting gases contain condensable vapours, is described, and the required amount of "gas ballast" determined. The smaller the vapour partial pressure, the lower is the volume of "gas ballast" required, so that a condenser to cool the incoming vapour is desirable. An enrichment of the gas above the condensing surface takes place, producing a so-called "gas veil." An experimental verification of the existence of this gas layer is described. S. W.

533.6.011.4/.5 = 82 60

Some investigations on flow of gases at critical velocities exceeding the speed of sound. KIBEL, I. A. *Bull. Acad. Sci. URSS, Dep. Sci. Tech.* (*No.* 3) 253–9 (1947) *In Russian.*—The difficulties of theoretical analysis of aerodynamic problems at ultrasonic speeds are explained and different approaches based on the behaviour of non-compressible fluids and of adiabatically compressible moving gases are discussed, It is shown that at critical speeds the air flow round wings possesses discontinuities (vortices). A. L.

533.6.011.5 : 535.338 : 537.22 : 537.523 = 4 *see Abstr.* 127

KINETIC THEORY OF GASES 533.7

533.7 : 533.15 61

Determination of the molecular law of force from self-diffusion coefficients. AMDUR, I. *Phys. Rev.*, **72**, 642–3 (*Oct.* 1, 1947).—Incorrect laws of force are deduced from values of $\rho D/\eta$ if interpreted on the assumption of point repelling molecules; firstly because the transport properties of gases depend on a combination of repulsive and attractive forces; and secondly because similar values of $\rho D/\eta$ can be obtained for different molecular-force models. W. E. D.

533.7 : 533.15 = 3 *see Abstr.* 53

533.7 : 533.275.08 : 533.15 *see Abstr.* 52

VIBRATIONS ACOUSTICS 534

534.014.2 = 3 62

Forced oscillations of a damped non-linear system with one degree of freedom. SÖCHTING, F. *Öst. Ingen. Arch.*, **1** (*Nos* 4–5) 382–9 (1947) *In German.*—A brief review of approximation methods for the theoretical study of different types of non-linear systems, with special regard to their accuracy. H. J. H. S.

534.015 : 531.391 63

The modal oscillations of discrete dynamical systems. INGRAM, W. H. *Phil. Mag.*, **38**, 51–61 (*Jan.*, 1947).—Dynamical systems governed by a certain vector equation are discussed, and the question of stability is examined. L. S. G.

534.213 64

The propagation of elastic waves in a rod. COOPER, J. L. B. *Phil. Mag.*, **38**, 1–22 (*Jan.*, 1947).—Transverse and longitudinal waves along a rod of small thickness but large width are treated by a Fourier transform method. More extensive results than those of Prescott [Abstr. 87 (1943)] are obtained. Both types of waves are dispersive and for a given wavelength there is an infinity of possible wave velocities. The max. velocity of propagation of a disturbance is V_D, the velocity of dilatational waves, and the physical nature of waves which appear to have a phase velocity $> V_D$ is discussed. This phase velocity is not a true wave velocity but the rate at which an oblique wave cuts the axis. It is suggested that the bulk of energy in a disturbance should not travel faster than the velocity of rotational waves. L. S. G.

534.222.2 : 535.338 = 4 *see Abstr.* 93

534.222.2 : 551.575 : 536.421–4 — 4 *see Abstr.* 115

534.23 : 534.845 = 4 65

Study, to the second approximation, of the acoustic transparency of a rectangular panel. VOGEL, T. *Ann. Phys., Paris* (*Sér.* 12) **2**, 502–16 (*Sept.–Oct.*, 1947) *In French.*—Continuation of earlier work [Abstr. 2799 (1947)]. A. B. W.

534.232 : 534.321.9 : 621.391.63 66

Ultrasonic modulation of a light beam. HUMPHREYS, R. F., WATSON, W. W., AND WOERNLEY, D. L. *J. Appl. Phys.*, **18**, 845–6 (*Sept.*, 1947).—A parallel light beam passes through a cell filled with xylol and containing a 7 Mc/s quartz crystal. When the crystal is excited the cell acts as a diffraction grating and if the crystal excitation is modulated, the light received in the zero diffraction order is likewise modulated. The method has been used for military signalling with a range of 3 000 yd by day and 5 000 yd by night. G. F. H.

534.232 : 539.32.08 : 534.321.9 = 4 *see Abstr.* 68

534.24 : 536.48

Conversion of ordinary sound into second sound. FAIRBANK, W. M., FAIRBANK, H. A., AND LANE, C. T. *Phys. Rev.*, **72**, 645–6 (*Oct.* 1, 1947).—Second sound has been generated by reflecting normal sound at a liquid vapour interface. The method of production and detection are described. W. E. I.

534.321.9 : 534.232 : 539.32.08 = 4

Supersonic generators and their applications. TSCHERNING, H. *Rev. Gén. Élect.*, **56**, 319–27 (*Aug.*, 1947) *French.*—Various types of piezo-electric, magnetostrictive and air jet devices for the production of supersonic vibrations are described and mention is made of several laboratory applications, in particular the determination of Young's modulus. H. J. H.

534.321.9 : 621.391.63 : 534.232 *see Abstr.* 66

534.845

Acoustic opacity of liquids. PANCHOLY, M., AND PARTHASARATHY, S. *J. Sci. Industr. Res.*, **5**, 109–(*Sept.*, 1946).—Following a brief discussion of the classical formulae for the attenuation coeff. (α) of sound in a medium, a comprehensive review is given of the methods which have been used for its determination in the case of liquids. Possible experimental errors are considered together with the theories advanced to account for the anomalous absorption obtained in liquids. Brief mention is made of experiments now in progress for studying the change of α/ν^2 with frequency (ν). G. F. H.

534.845 : 534.23 = 4 *see Abstr.* 65

OPTICS . RADIATION . SPECTRA 535

535.1 = 4

The theories of light. CABANNES, J. *Rev. Opt.* (*Théo Instrum.*), **26**, 333–53 (*Oct.*, 1947) *In French.*—A historic review. L.

535.13 : 538.56

The reflection of an electromagnetic plane wave by a infinite set of plates. II. HEINS, A. E., AND CARLSON, J. F. *Quart. Appl. Math.*, **5**, 82–8 (*April*, 1947).—A continuation of previous work [Abstr. 1168 (1947)]. A Fourier transform method is used. The magnetic field of the incident wave is taken parallel to the edges of the plate. The reflection and transmission coefficients are calculated. These are independent of the wavelength of the incident wave. L. S. G.

535.135 : 537.566.2 = 4

The propagation of e.m. waves in a stratified non magnetic medium. ABELÈS, F. *C.R. Acad. Sci., Paris* **225**, 569–71 (*Oct.* 6, 1947) *In French.*—An exact solution of Maxwell's equations is obtained for a refractive index of the form $n = n_0(1 + az)^{-2}$. The velocities of the electric and magnetic vectors are different. The transmission of a thin plate of such a material between two transparent media is also given. L.

535.14.08 : 537.542 = 4 *see Abstr.* 138

535.214.6 = 4

Theoretical notes on photophoresis and helical movement. TAUZIN, P. *C.R. Acad. Sci., Paris*, **225**, 350–1 (*Aug.* 1947) *In French.*—The helical movement of particles suspended in air produced by an intense beam of light is discussed theoretically. In addition to the effect produced in a vacuum account must be taken of the role played by the air. W. R.

535.214.6 : 537.363 = 4

Photophoresis effects. Experimental facts and tentative explanation. TAUZIN, P. *Ann. Phys., Paris* (*Sér.* 12) 457–85 (*Sept.–Oct.*, 1947) *In French.*—The displacement

suspended particles in air under the influence of an ense beam of light has been determined (*a*) in the ection of the beam, (*b*) in the opposite direction ngitudinal photophoresis), (*c*) in a direction at right gles to that of the beam (transverse photophoresis), with the added influence of electric or magnetic fields ectro- and magneto-phoresis). The particles perform rating or helical movements. Detailed results for a arc in N_2 are discussed. Tentative explanations are anced and the relationships of the effect to radiation ssure and radiometric effect are considered. W. R. A.

5.215 : 621.385.032.216 : 537.583 = 4 *see Abstr.* 140

5.218 : 538.224 = 4 *see Abstr.* 156

5.233 : 535.681 : 621.327.4 = 4 75

Definition of colour temperature of fluorescent lamps. RNAY, F. *Bull. Soc. Franç. Élect.* (*Sér.* 6) **6**, 468–75 *ug.–Sept.*, 1946) *In French.*—In strictness, only a source ing a black-body spectral distribution can have a lour temp., but the approx., or pseudo-colour-temp., other sources is a convenient way of describing their pearance, although it gives little information about eir colour-rendering properties. The author discusses possible alternative ways of arriving at such a pseudo-lour-temp. in the case of such sources as fluorescent mps. The colour-rendering of four types of lamps, . tungsten and fluorescent daylight, white and warm ite is described. J. W. T. W.

5.24 : 576.8 = 4 76

Recording differential photometer for six records. ALEN, R., AND BONÉT-MAURY, P. *Cah. de Phys.* os. 29–30) 87–103 (*June*, 1947) *In French.*—Describes automatic photo-electric photometer which gives a cord of the difference between the opacities of two lutions containing microbe cultures. By using photo-ls in opposition, the scale of the record can be suited the difference produced by some antimicrobic agent ded to one solution; thus small differences can be corded directly, instead of being shown as the difference ween two much larger quantities. J. W. T. W.

5.24.001 = 4 77

How should visual brightness be defined? BLOTTIAU, F. *v. Opt.* (*Théor. Instrum.*) **26**, 370–7 (*Oct.*, 1947) *In ench.*—The system of photometry adopted by the .E. and in general use is purely physical whereas the easurements involved are properly psycho-physiological. stances are cited in which the physical measurement is ntradicted by observation. The author proposes that ystem of measurement, corresponding with experience, ould be adopted, based, e.g., on a scale of "visibility" ps and on a "legibility distance" in the case of mination. J. W. T. W.

5.24.001 = 4 78

Definition of photometric quantities. TERRIEN, J. *v. Opt.* (*Théor. Instrum.*) **26**, 411–20 (*Nov.*, 1947) *In ench.*—A reply to F. Blottiau [see Abstr. 77 (1948)] which it is pointed out that the system of photometry current use is frankly physical, and only related to the ycho-physiological sensation by the agreed luminosity rve, which is a fair representation of the response of e average eye. To introduce into photometry the odifications necessary to take account of changes of e behaviour due to variations in the conditions of servation would create unlimited confusion. The stinction between the stimulus and the sensation must carefully drawn and for this reason a new word is eded to denote the sensation corresponding to the imulus of brightness. J. W. T. W.

535.243 : 523.75 : 522.615 = 4 *see Abstr.* 5

535.312 : 532.594 79

Reflection of light by rippled water surfaces. VAN WIERINGEN, J. S. *Proc. K. Ned. Akad. Wet.*, **50** (*No.* 8) 952–8 (1947).—Reflected image of a light source in a rippled surface is shown by geometrical optics to be a light pillar, limited generally by a curve of the 6th degree. The light pillar degenerates to a single 3rd degree curve for parallel ripples. These curves are reduced to the 4th and 2nd degree respectively when the source is at ∞. H. H. HOP

535.312 : 538.56 = 4 *see Abstr.* 160

535.312.2 80

Multiple reflections by plane mirrors. TUCKERMAN, L. B. *Quart. Appl. Math.*, **5**, 133–48 (*July*, 1947).—The reflections are conveniently studied by means of quaternions. Illustrations of the computations are given for a range-finder 5-mirror/prism combination and for the Leman–Sprenger non-deviating erecting prism. [See Abstr. 64 (1947)]. L. S. G.

535.312.2 81

The product of three reflections. COXETER, H. S. M. *Quart. Appl. Math.*, **5**, 217–22 (*July*, 1947).—An alternative method of treatment to that of Synge [Abstr. 64 (1947)] and Tuckerman [Abstr. 80 (1948)] is given. This involves working with spherical triangles. L. S. G.

535.317 82

The relations between an incident ray and its emergent ray through an optical system. BUXTON, A. *Phil. Mag.*, **38**, 325–31 (*May*, 1947).—The relations are expressed in terms of Hamilton's *T*-function, which is quoted for a single spherical surface. Application is made to a thick lens, and the method may also be used in the case of non-spherical surfaces. L. S. G.

535.317 = 4 83

Numerical calculation of oblique rays. TEMMERMAN, F. *Rev. Opt.* (*Théor. Instrum.*) **26**, 425–33 (*Nov.*, 1947) *In French.*—Young's graphical construction for ray tracing in the meridian plane is generalized to meet the case of skew rays, and is formulated analytically. There result simple formulae for the tracing of skew rays through any system of spherical surfaces, which do not require trigonometrical tables. H. H. HOP.

535.317.1 84

Parallax methods in optics. ASHFORD, C. *Phil. Mag.*, **38**, 580–92 (*Aug.*, 1947).—The theory of the no-parallax method of locating a real image is developed more accurately than the elementary theory, which is accurate only to a first approximation. This involves the study of the effect of a lens upon an eccentric ray. Errors of the method are calculated, and an alternative method which eliminates these errors is described. L. S. G.

535.317.25 : 535.42 = 4 85

Vision with an instrument affected with spherical aberration. I. Role of the pupil. FRANÇON, M. *Rev. Opt.* (*Théor. Instrum.*) **26**, 354–69 (*Oct.*, 1947) *In French.*—The effect of spherical aberration on the contrast of the image of a Foucault test chart is determined by evaluating the diffraction integral. The efficiency is defined as the ratio of the limiting resolvable separation of the unaided eye to that of the instrument-eye combination. It is found to vary with the choice of focus and the size of pupil. It is concluded that for small pupils (0·8 mm) a high degree of correction is called for, but that poorer correction can be tolerated for larger pupil diameters (4–5 mm). These results derive from experimental investigations. H. H. HOP.

535.327 : 539.213 : 666.115 = 4 86

Variation of the properties of glass as a function of temperature and time. CAHOUR, J.-A. *Cah. de Phys.* (*Nos* 29–30) 25–50 (*June*, 1947) *In French.*—Describes measurements of the refractive index of two glasses at temps. in the transformation region. A "transformation point" is observed and curves are given showing the slow approach to equilibrium below this point. The over-all variation with temp. as ordinarily measured shows a max. at the transformation point, which coincides with the transformation point derived from thermal expansion measurements. Results are discussed with reference to structural theories. G. O. J.

535.33 : 538.615 = 4 87

The classical theory of the Zeeman effect of multipole radiation. (An application of the principle of correspondence.) PLUVINAGE, P. *Ann. Phys., Paris* (*Sér.* 12) **2**, 486–501 (*Sept.–Oct.*, 1947) *In French.*—The Zeeman effect of a singlet octupole line is calculated. Some general results for multipole radiation of any order are established. [See also Abstr. 3815 (1947)]. L. P.

535.33/.34 : 537.531 *see Abstr.* 130–1

535.33–15 : 523.77 *see Abstr.* 10

535.33.072 : 537.531 *see Abstr.* 132

535.33.072–14 : 538.569.4 88

A new electronic system for detecting microwave spectra. GORDY, W., AND KESSLER, M. *Phys. Rev.*, **72**, 644 (*Oct.* 1, 1947).—See Abstr. 2104 (1947). The slowly varying sawtooth voltage which sweeps the oscillator is modulated by a 100 kc/s oscillation. An absorption line of the gas gives an intensity modulation of the output at the frequency of the modulation. A single crystal and amplifier tuned to the modulation frequency is used as detector. The method is no more sensitive than the Stark effect method [Abstr. 1814 (1947)], but is simpler. W. E. D.

535.33.072–15 : 522.6 *see Abstr.* 4

535.331 : 537.525 *see Abstr.* 128–9

535.332 89

Wave-length measurements in the visible spectrum of argon II. MINNHAGEN, L. *Ark. Mat. Astr. Fys.*, **34A** (*No.* 22) 14 *pp.* (1947).—Tables of wavelengths are given with classification. Many lines are newly identified. L. P.

535.332 : 551.594.4 = 4 90

The spectrum of ionized helium in the aurora. BERNARD, R. *C.R. Acad. Sci., Paris*, **225**, 390–1 (*Aug.* 25, 1947) *In French.*—A line at 4 685 A in the spectrum of the upper aurora is attributed to He II, suggesting the same origin for one at 3 203·7 previously noted by Vegard. D. L. E.

535.337 : 537.525 = 4 91

Influence of the nature of the capillary on the continuous spectra of condensed discharges through gases at low pressure. ROMAND, J., AND VODAR, B. *C.R. Acad. Sci., Paris*, **225**, 574–6 (*Oct.* 6, 1947) *In French.*—Conditions for producing a good source of light for absorption spectroscopy in the far u.v. are examined. The intensity depends on current density and the nature of the material of the capillary, but not on the nature or pressure of the gas. SiO_2 and Al_2O_3 are superior to BeO, MgO or ZrO_2; Al_2O_3 has the longest life. A. G. G.

535.338 92

On the normalization of characteristic differentials in continuous spectra. WINTNER, A. *Phys. Rev.*, **72**, 516–17 (*Sept.* 15, 1947).

535.338 : 534.222.2 = 4 9

Notes on the continuous spectra obtained by collisio between shock waves in different gases. MURAOUR, H *Cah. de Phys.* (*Nos* 29–30) 51–4 (*June*, 1947) *In French.*– A discussion of the fact that for He, O_2 and air the energ radiated in the visible spectrum does not vary muc with λ, while for A the distribution is that of a blac body. L. I

535.338 : 537.22 : 533.6.011.5 : 537.523 = 4 *see Abstr.* 127

535.338.1 : 535.371.07 = 4 *see Abstr.* 98

535.338.3 : 539.153 *see Abstr.* 172

535.338.4 : 535.35 9

Comparison of band intensities of the first positive syste of nitrogen with those of the second positive: their d pendence on the radiative and collision lives of molecule TAWDE, N. R., AND PATANKAR, V. S. *Phil. Mag.*, 3 65–70 (*Jan.*, 1947).—Experimental technique is described previously [Abstr. 2767 (1943)]. There is general reduction in the intensities of the bands of th 2 systems as compared with that of the (0, 0) band of th second positive system, when the discharge is change from pure N_2 to dry air; also the reduction for the 2n positive ≪ for the 1st positive. The decrease in th intensities may be due to (*a*) increase in the radiati life-time, or (*b*) decrease in the value of the collision lif of an excited molecule. These two possibilities a discussed. L. S. C

535.34 : 535.42 : 537.531 *see Abstr.* 133

535.34 : 538.569.4 = 4 *see Abstr.* 163

535.343.4–14 9

Saturation effect in microwave spectrum of ammoni SMITH, W. V., AND CARTER, R. L. *Phys. Rev.*, **72**, 638 (*Oct.* 1, 1947).—Results are in agreement with those Townes [Abstr. 828 (1947)] that the power absorbed the centre of an absorption line reached a saturation val which remained constant to within 20% in one particul experiment over a power region from 600 to 6 000 μW The lower power end of this limit varied directly as th gas pressure. Broadening of the line, as reported b Townes, was not observed. W. E. I

535.343.4–14 : 539.132 : 539.152.1 9

Microwave spectra of linear molecules. TOWNES, C. H HOLDEN, A. N., AND MERRITT, F. R. *Phys. Rev.*, 7 513–14 (*Sept.* 15, 1947).—Measurements on the $J = 1 \rightarrow$ transitions in $O^{16}C^{12}S$ for the molecules with the S and S^{32} isotopes combined with the results of the sam molecule with the isotopes S^{32} and S^{34} [Abstr. 219 (1947)] lead to a value of 0·49985 ± 0·0001 for the rati of the mass differences $(S^{33} - S^{32})/(S^{34} - S^{32})$ in fa agreement with the value given by Mattauch [*Nuclea Physics Tables*, p. 128 (1946)]. It is pointed out that th estimates of bond distances by earlier experimenters hav omitted the zero-point energy. No quadrupole splittin of OCS^{33} or OCS^{34} lines was observed from which it deduced that the quadrupole moment of $S^{34} < 0·001 \times 10^{-24}$ and is probably zero. The spin of S^{33} is deduce to be ½. Similar investigations on $O^{16}C^{13}S^{32}$ an $Cl^{35}C^{13}N^{14}$ indicate a spin of ½ for C^{13}. The *l*-typ doubling of the ClCN lines, like those of BrCN and OC give a separation ~ 40% > the theoretical value. W. E. I

535.343.4.092–31 = 4 9

The ultra-violet absorption spectrum of nitrogen gas 1 200 kg/cm². ROBIN, S., VODAR, B., AND PHILBERT, C *C.R. Acad. Sci., Paris*, **225**, 495–7 (*Sept.* 22, 1947) *French.*—Continuous absorption increasing from 3 00 to 2 000 Å and bands in the range 2 550 to 2 850 Å a attributed tentatively to N_2. R. F. I

.35 : 535.338.4 *see Abstr.* 94

.371.07 : 535.338.1 = 4 98

Phosphorescence of oxygen in a helium atmosphere. RMAN, R. *C.R. Acad. Sci., Paris*, **225**, 287–9 (*Aug.* 4, 7) *In French.*—Combination of O and O^+ formed in charges through He–O_2 mixtures leads to phos-prescent emission of the $^4\Sigma - {}^4\prod$ bands of O_2^+.

R. F. B.

.375.5 99

Raman spectra of methyl alcohol, ethyl alcohol and eptane. NARAYANASWAMY, P. K. *Proc. Indian Acad. . A*, **26**, 121–31 (*Aug.*, 1947).—Excitation of Raman ctra by the 2 537 Å Hg line is favoured and the tech-ue of its employment is described. The spectra of OH, EtOH and n-C_7H_{16} are reported and discussed. ngs accompanying the Rayleigh line are found for h.

W. R. A.

.375.5 : 539.13 100

On the Raman spectrum of *p*-diphenyl benzene. JKERJI, S. K., AND SINGH, L. *Phil. Mag.*, **37**, 874–83 ec., 1946).—The spectrum of both solid and molten liphenyl benzene was examined; 24 new lines were orded for the former and 12 for the latter. The results discussed with reference to the Raman spectra of henyl, and ortho- and meta-diphenyl benzene. It is ggested that the molecule of *p*-diphenyl benzene is nar in form.

L. S. G.

.39 = 4 101

Study of some optical properties of anti-reflection films. RROT, M. *Rev. Opt.* (*Théor. Instrum.*) **26**, 295–306 pt., 1947) *In French.*—Using formulae derived from n. theory and a graphical construction, the thicknesses d optical constants of such films are determined directly. ree cases are studied: transparent film on a transparent pport; metallic film on a transparent support; and nsparent film on a metallic support.

H. H. HOP.

.39 = 5 102

Transmission and reflection by thin laminae having fractive index less than unity. SCANDONE, F., AND ONE, G. *Nuovo Cim.*, **1**, 325–53 (*Aug.*, 1943) *In Italian.*—e intensity of the light transmitted and reflected by thin minae is calculated, for components polarized in, and rpendicular to, the plane of incidence respectively, also natural light. Tables are given for refractive index , and the trends are illustrated graphically.

A. C. M.

.39 = 4 103

Erratum: Selective and metallic reflection. ARZELIÈS, H. n. *Phys., Paris* (*Sér.* 12) **2**, 555 (*Sept.–Oct.*, 1947) *In ench.* See Abstr. 2113 (1947).

.412 = 4 104

Study of the visibility of fringes of equal thickness for a nochromatic light source of finite dimensions. FRANÇON, . *Rev. Opt.* (*Théor. Instrum.*) **26**, 434–40 (*Nov.*, 1947), *French.*—If θ is the angle subtended by the side of a uare source at a collimating lens, e being the thickness an inclined plate of index n, very good visibility of the nges obtains for $\theta\sqrt{(e/n\lambda)} \leqslant 1$. It is shown that visi-ity is greatly increased with the plate normal to the am of light.

H. H. HOP.

.42 105

Diffraction of light. PIDDUCK, F. B. *Phil. Mag.*, **38**, 9–41 (*June*, 1947).—An error in a recent paper [Abstr. 8 (1947)] is corrected and some experiments on Talbot's nds are described. The results agree with the theory.

L. S. G.

535.42 = 4 106

On the experimental verification of the distribution of light in diffraction images, and the legitimacy of the application of the Huygens–Fresnel principle. MARÉCHAL, A. *C.R. Acad. Sci., Paris*, **225**, 497–8 (*Sept.* 22, 1947) *In French.*—Using photographic photometry the light distributions in the absence of aberrations, in the presence of a defect of focus, and in the presence of astigmatism have been determined. Good agreement exists between these measurements and the results of calculations using a mechanical integrator. This confirms the accuracy of the latter, and the validity of the Huygens–Fresnel principle.

H. H. HOP.

535.42 : 535.317.25 = 4 *see Abstr.* 85

535.42 : 535.34 : 537.531 *see Abstr.* 133

535.43 : 535.515 107

The scattering of polarised light beams in birefringent solids. CHANDRASEKHARAN, V. *Proc. Indian Acad. Sci. A*, **26**, 110–13 (*Aug.*, 1947).—When a plane-polarized light beam advances inside a birefringent solid, the state of polarization undergoes a periodic cycle of changes which, in the transversely scattered beam, are manifested as fluctuations in intensity along the track. For a complete cycle there would be a band, appearing most markedly when both the azimuth of the incident light vector and that of observation are at 45° to the principal planes of the solid, and disappearing when either azimuth coincides with one of the principal planes. Photographs of the effect exhibited by three synthetic polymers are reproduced.

W. R. A.

535.43 : 537.531 *see Abstr.* 134

535.51 : 523.872 *see Abstr.* 14

535.515 : 535.43 *see Abstr.* 107

535.515.096 : 548.0 108

Birefringence of crystals and its temperature variation. II. Sodium and potassium nitrates. RAMACHANDRAN, G. N. *Proc. Indian Acad. Sci. A*, **26**, 114–20 (*Aug.*, 1947).—Using an earlier theory [Abstr. 3498 (1947)] dispersion formulae for KNO_3 and $NaNO_3$ have been developed. For the indices of each two dispersion frequencies at 2 000 and 1 100 Å and a const. term to represent a remote u.v. frequency are sufficient. The nearest frequency at 2 000 Å is inactive in a direction at right angles to the NO_3^- ion and accounts for most of the birefringence. The temp. variation of the refractive indices for $NaNO_3$ has been calculated.

W. R. A.

535.55 : 548.0 109

Photo-elastic effect in crystals. A new result for the T_h class. BHAGAVANTAM, S., AND SURYANARAYANA, D. *Proc. Indian Acad. Sci. A*, **26**, 97–109 (*Aug.*, 1947).—Examination of crystals of K alum substantiate the earlier prediction of Bhagavantam that crystals of the T_h class need 4 independent constants instead of 3 to describe their photo-elastic properties. The values of these constants and of strain-optical coefficients have been ascertained.

W. R. A.

535.681 : 621.327.4 : 535.233 = 4 *see Abstr.* 75

HEAT 536

536.2 110

Numerical results for some problems on conduction of heat in slabs with various surface conditions. JAEGER, J. C., AND CLARKE, M. *Phil. Mag.*, **38**, 504–15 (*July*, 1947).—The problems relate to the slab $0 < x < l$ with these boundary conditions at $x = 0$ and $x = l$: prescribed temperature, prescribed flow of heat, radiation,

and contact with a well-stirred fluid. Graphs of various functions arising in the solution of these problems are given, and these facilitate numerical work in practical cases. L. S. G.

536.2 111

Note on a problem in heat conduction. TRANTER, C. J. *Phil. Mag.*, **38**, 530–1 (*July*, 1947).—See Abstr. 859 (1947). An improved solution. L. S. G.

536.21 112

A problem on the conduction of heat. WALTERS, A. G. *Phil. Mag.*, **38**, 70–8 (*Jan.*, 1947).

536.21 113

Heat flow in an infinite medium heated by a cylinder. TRANTER, C. J. *Phil. Mag.*, **38**, 131–4 (*Feb.*, 1947).—The problem of the heat flow is solved by a Laplace transform method and numerical results are obtained for the case in which the thermal conductivity of the cylinder is large. Results are compared with Whitehead's solution [Abstr. 207 A (1945)]. L. S. G.

536.253.097 : 545.7 *see Abstr.* 200

536.413 : 539.4.013 : 531.259 *see Abstr.* 43

536.421.1 : 539.11 114

On the melting points of deuterium compounds. STOKLAND, K. *K. Norske Vidensk. Selsk. Forh.*, **19** (*No.* 10) 33–6 (1946).—Previous work by Clusius [Abstr. 774 (1938)] indicated that for any pair of normal isotopic hydrogen compounds the m.p. of the deuterium compound was lower than that of the corresponding protium compound, whilst for substances associated in the liquid phase the converse was true. The present author shows that this rule is not always valid; it is obeyed by the mono- and di-silanes but not by the tri- and tetra-silanes, while there is a progressive change in the differences of the m.p's. with increasing molecular weights of the silanes. From theoretical considerations it is concluded that the intermolecular vibration energy and the molar volume of a deuterium compound at the absolute zero is < the same properties of the corresponding protium compound, i.e. the former has the closer packing of the molecules. Thermal data of phase changes of some isotopic hydrogen compounds are included. It seems probable that for substances where molecules have relatively small moments of inertia, the translational will predominate over the rotational effect. For substances with more complex molecules, however, the initiation of rotation requires relatively more energy, and the rotational effect would then be expected to determine the sign of the difference in m.p's. The m.p's of the silanes constitute very interesting support of this theory. H. H. HO.

536.421.4 : 551.575 : 534.222.2 = 4 115

Remote freezing [congélation à distance] of a supercooled cloud by shock waves. MAURIN, J., AND MÉDARD, L. *C.R. Acad. Sci., Paris*, **225**, 432–4 (*Sept.* 8, 1947) *In French.*—It was known qualitatively that fog particles would be solidified by waves produced by a klaxon, siren or rifle. Tests were carried out at Mont-Lachat by the ignition electrically of 50 g of penthrite to obtain quantitative measurements of the rate of freezing produced by the shock waves. It was found that a small drop would be frozen by a pressure discontinuity of 10^5 g/cm²/sec. R. S. R.

536.44 : 536.71 = 3 *see Abstr.* 116

536.45 : 533.15 *see Abstr.* 55

536.48 : 532.133 = 3 *see Abstr.* 47

536,48 : 532.7 : 532.133 *see Abstr.* 48

536.48 : 533.15 *see Abstr.* 54

536.48 : 533.24 = 4 *see Abstr.* 58

536.48 : 534.24 *see Abstr* 67

536.48 : 537.226.1 = 4 *see Abstr.* 119

536.48 : 539.11 = 4 *see Abstr.* 165

THERMODYNAMICS 536.7/.8

536.7 : 533.15 = 4 *see Abstr.* 56

536.7 : 541.183 : 532.61 *see Abstr.* 51

536.71 : 536.44 = 3 1

The equation of state with reference to the critic coefficient. KÄMMERER, C. *Ost. Ingen. Arch.*, **1** (*Nov* 5) 253–73 (1947) *In German.*—The following equatio of state are considered: van der Waals, $p = RT$ $+ b/v^2 - a/v(v + c)$, $p = RT/v + b/v^n - a/v^m$ where and n are not necessarily integral, and the spec cases $p = RT/v + c/v^2(v + b) - a/v^2$, $p = RT$ $+ (b - av)/v^2(v + c)$, $p = RT/v - a(v^2 + cv + b)$. is shown that the introduction of the critical coefficie $k = RT_c/p_cv_c$, into the equation of state through fourth constant produces a better representation of critical isotherm. For very strongly associated su stances (high k) the agreement is unsatisfacto Assuming that $k > 3$ is due only to the association, equation of state with $k = 3$ is used to calculate t variation of the physical molecular weight, μ, and by suitable choice of $\mu(v)$ better agreement is obtained, volumes above the critical, for the critical isotherm water. A value for the Boyle temp. is obtained from t temp.-dependence of the "attractive" and "repulsiv terms in the equation of state. S.

536.73 : 536.8 1

The second law of thermodynamics, with particul reference to Carnot theorems relating to regenerativ refrigeration and warming cycles. WALKER, W. J. *Ph Mag.*, **37**, 842–54 (*Dec.*, 1946).—The Ostwald-Plan proposition relating to the second law is prove Expressions for the efficiency and coefficient of pe formance for engine and refrigerator regenerative cycl are developed and the warming efficiency of combinatio of these is examined. The comparable Carnot temper ture limits for these cycles are unique. The relation the regenerative cycle to the problem of the cooling hot mine air is examined. L. S.

536.8 : 536.73 *see Abstr.* 117

ELECTRICITY 537

537.122 : 530.14 = 3 1

On the derivation of the magnetic moment of the electro VRKLJAN, V. S. *Proc. Indian Acad. Sci. A*, **26**, 523 (*June*, 1947) *In German.*—The magnetic moment derived using a wave-packet solution of the Dir equation. G. J.

537.122 : 538.31 : 530.14 *see Abstr.* 32

537.133 : 537.591.1 *see Abstr.* 141–2

537.133 : 539.165 : 539.163.2 *see Abstr.* 179

537.133 : 539.172.3 = 3 *see Abstr.* 188

537.212 : 523.8 *see Abstr.* 11

537.22 : 533.6.011.5 : 535.338 : 537.523 = 4 *see Abstr.* 127

537.226.1 : 536.48 = 4 1

Determination of the dielectric constant of liqu deuterium. VAN ITTERBEEK, A., AND SPAEPEN, J. *Physic 's Grav.*, **9**, 339–44 (*March*, 1942) *In French.*—Th

surements (18° to 22°K) can be represented within % by the Clausius–Mosotti formula. The molar rizibility calculated by this formula gives 1·98$_5$ for compared with 1·99$_1$ for H. The accuracy claimed 05%. H. L.

226.3 : 537.226.8 : 621.3.011.5 : 621.315.611 120
remarkable property of technical solid dielectrics. ERS, M., AND DU PRÉ, F. K. *Philips Tech. Rev.*, 9 3) 91–6 (1947).—[See Abstr. 3197 (1947)].

226.8 : 621.3.011.5 : 621.315.611 : 537.226.3 *see Abstr.* 120

226.8 : 621.315.612.3 : 666.329 121
icroscopic and X-ray investigation of some steatite es. RIGTERINK, M. D. *J. Amer. Ceram. Soc.*, 30, -18 (*July*, 1947).—[Abstr. 204 B (1948)].

ELECTRIC CURRENTS 537.3

311.32 : 537.312.62 122
n the superconductivity of solutions of sodium in onia. TUMANOV, K. A., SHALNIKOV, A. I., AND RVIN, J. V. *C.R. Acad. Sci. URSS*, 56 (*No.* 1) 35–7 7).—Measurements in weak magnetic fields of the eptibility of rapidly cooled Na–NH$_3$ solutions no indication of the persistent currents reported Ogg [Abstr. 1894 (1946)] and Hodgins [Abstr. 878 7)]. See also Abstr. 2890, 3156 (1946), 1866 (1947). H. L.

311.33 : 621.314.632 : 537.311.4 *see Abstr.* 123

311.4 : 537.311.33 : 621.314.632 123
xcess-defect semiconductor contacts. SOSNOWSKI, L. *s. Rev.*, 72, 641–2 (*Oct.* 1, 1947).—Expressions are n for the three contributions to the current across boundary between regions of excess and defect ductivity, viz. the flow between conduction bands, veen ground bands and between the overlap of a nd band on one side and a conduction band on the r. Theoretical rectifying curves compared with rimental results on PbS at − 80°c give good agree- it when a cell containing 5 elements in series is med. W. E. D.

312.62 = 3 124
uperconductivity. JUSTI, E. *Naturwiss.*, 33, 292–7 . 30; 329–33 (*Dec.* 15, 1946) *In German.*—Review of ady published knowledge. H. L.

.312.62–96 125
ome experiments on superconductivity at radio- uencies. LASAREV, B. G., GALKIN, A. A., AND OTKEVICH, V. I. *C.R. Acad. Sci. URSS*, 55 (*No.* 9) -7 (1947).—Alternating currents of either 50 or ×10^6 to 2×10^7 c/s were superimposed on a direct ent in wires of superconducting Tl. A d.c. voltage observed which went through a max. if the a.c. increased at const. d.c. At 50 c/s the results can be erstood by assuming instantaneous destruction and stablishment of superconductivity when the critical l is passed. At r.f. the max. becomes more and more ened as the frequency increases. This behaviour is ught to be due to relaxation phenomena with a time stant of ∼ 10^{-8} sec. H. L.

312.62 : 537.311.32 *see Abstr.* 122

.321 126
he theory of the thermo-electric power of metals. DHEIMER, E. H. *Proc. Camb. Phil. Soc.*, 43 (*Pt* 4) -5 (1947).—An interpolation formula is set up, which ces at high and low temps. to the correct 1st-order ressions for the thermo-electric power obtained with a free electric model by Wilson. This formula accounts for the temp.-variation in the alkali metals, where the theory is valid, and is also used to discuss the effect of impurities on the thermo-electric power. G. J. K.

537.363 : 535.214.6 = 4 *see Abstr.* 74

ELECTRIC DISCHARGES AND RADIATIONS 537.5

537.523 : 537.22 : 533.6.011.5 : 535.338 = 4 127
Electrification phenomena in a supersonic blower. SEVAULT, A. *C.R. Acad. Sci., Paris*, 225, 720–2 (*Oct.* 27, 1947) *In French.*—The author investigates and extends the electrical and luminous phenomena [TESSON, *C.R. Acad. Sci., Paris*, 218, 268–70 (1944)] exhibited when a high-velocity blast (Mach number, 1·8) is incident upon a pointed steel rod arranged axially in the blast. A very bright luminous electrical discharge is observed to extend in the form of an aigrette from the point of the rod to the glass wall of the conduit. The drop of potential across the discharge is of the order 12 kV. The discharge comprises a band spectrum, with band-heads directed towards the short wavelengths; it is therefore presumed that the phenomena is not associated with any appreciable ionization. The luminescence of the discharge is attributed to the second positive group of N_2. A temperature of about − 90°c is produced by the expansion of the moist air in the blast, and ice particles produced in the blast acquire large positive charges. J. S. G. T.

537.525 : 535.331 128
Doppler and retrograde Doppler effect in the resonance radiation of mercury λ 2537Å. DAKSHINAMURTI, C. *Phil. Mag.*, 38, 442–6 (*June*, 1947).—To produce the Hg positive rays, discharge potentials between 2 and 24 kV were used. Maximum Doppler displacements correspond to a singly charged Hg atom. An intense retrograde strip, which indicates the ready formation of negative ions of Hg in front of the cathode, is observed. Negative ions are formed in abundance below 11 kV, but are negligible between 11 and 24 kV. A soft glass discharge tube of Wien's type with a quartz window was used in the experiments. L. S. G.

537.525 : 535.331 129
Triatomic hydrogen in discharge tubes. DAKSHINAMURTI, C. *Phil. Mag.*, 38, 447–51 (*June*, 1947).—The Doppler effect in H_γ, H_δ and H_ε lines in the hydrogen positive rays was studied for discharge potentials from 0·5 to 4·0 kV. H_3^+ and H_1^+ particles were found to predominate between 0·5 and 2·5 kV while H_2^+ was negligible. Above 2·5 kV, H_3^+ was absent but H_1^+ and H_2^+ were present. The pressure corresponding to 2·5 kV was 0·09 mm. These results support the view that H_2^+ is the primary particle which dissociates into H_3^+ and H_1^+ at high pressures. [See Abstr. 638 (1947)]. L. S. G.

537.525 : 535.337 = 4 *see Abstr.* 91

537.531 : 535.33/.34 = 4 130
***L* absorption and emission spectra of dysprosium.** BARRÈRE, G. *J. Phys. Radium* (*Sér.* 8) 8, 72–82 (*March*, 1947) *In French.*—Discrepancies of several X-units between previous values for the *L* absorption edges of Dy led to their redetermination. It was found advantageous to use comparatively thick absorbing layers, containing 10–13 mg of Dy (as the oxide) per cm². A Cauchois curved-mica spectrograph was used, and suitable emission lines for calibration were recorded on each plate. Each edge was preceded on the high-frequency side by a series of maxima and minima. The edges obtained were L_I 1·36551 kX, the series extending to 1·3535, L_{II}

1·44149, the series extending to 1·434, and L_{III} 1·58825, the series extending to 1·580. Seventeen lines and two satellites of the emission spectrum were also observed, the main ones being $L\alpha_1$ 1·90485 kX, $L\alpha_2$ 1·91593, $L\beta_1$ 1·70709, $L\beta_2$ 1·62034, and $L\gamma_1$ 1·46962. Lines observed for Tb (present as an impurity) were $L\beta_1$ 1·77288 and $L\gamma_1$ 1·52728. The error in measurement was ~0·0001 kX. The electronic structure of the atom is discussed in the light of the observations. A. J. C. W.

537.531 : 535.33/.34 131

The *L* emission and absorption spectra of copper in pure metal, α-brass, cuprous and cupric oxide. SØRUM, H. *K. Norske Vidensk. Selsk. Forh.*, **19** (*No.* 13) 44–7 (1946).—The spectrograph described in Abstr. 132 was used. Alpha-brass shows stronger *L* satellites in emission than Cu but the max. is not shifted. The absorption edges of brass and Cu_2O are shifted 5·5 and 8 X toward shorter wavelengths. The CuO edge is complex, the main step being 26 X toward longer wavelengths. A. J. C. W.

537.531 : 535.33.072 132

A high-vacuum X-ray spectrograph with concave crystal for comparison measurements. SØRUM, H. *K. Norske Vidensk. Selsk. Forh.*, **19** (*No.* 14) 48–51 (1946).—The anode, cathode, bent crystal and film are contained in the same evacuated enclosure of ~ 52 cm dia. and 8·5 cm height. The anode and cathode are movable (vacuum seal made with tombac bellows) so that radiation either direct from the target or scattered by the filament housing can be used. A movable slot covering part of the film makes it possible to record comparison spectra on the same film. A. J. C. W.

537.531 : 535.42 : 535.34 133

A random-absorption effect in diffraction of X-rays from coarse powders. WILCHINSKY, Z. W. *Phys. Rev.*, **72**, 511 (*Sept.* 15, 1947).—A calculation is made of P/P_0, where P is the intensity of X-rays diffracted by the powder of a single substance and P_0 the corresponding intensity for the substance in the solid form. Good agreement is found with experiment for the two comparisons made when the powder sizes are ~ 15 microns and ~ 30 microns respectively. W. E. D.

537.531 : 535.43 134

X-ray scattering at very small angles. BEEMAN, W. W., AND KAESBERG, P. *Phys. Rev.*, **72**, 512 (*Sept.* 15, 1947).—A method similar to that of DuMond is reported and conditions are discussed whereby the refraction effects can be minimized. W. E. D.

537.531 : 616–073.75 : 620.179.15 : 778.33 *see Abstr.* 209

537.533.73 : 548.74 = 3 135

On the theory of Kikuchi envelopes. I–II. ARTMANN, K. *Z. Phys.*, **124** (*Nos* 1–2) 80–104, 154–74 (1947) *In German.*—Presents a qualitative account of the author's theory of the origin of Kikuchi envelopes, according to which they arise partly from a surface effect and partly from a space lattice effect, involving the multiple reflection of inelastically scattered waves. A mathematical treatment is given in II. J. T.

537.533.8 : 621.385.15 = 4 136

The present state of knowledge of secondary emission from solids. PALLUEL, P. *Ann. Radioélectricité*, **2**, 199–223 (*July*, 1947) *In French.*—A descriptive review of recent work on secondary emission. Sections are given on the following topics: (1) general description of the phenomenon, including the Malter effect; (2) mechanisms which take part in the process, elastic reflection, ionization and back-scattering; (3) secondary emission in metals; (4) secondary emission in alkali and alkaline earth metals; (5) emission of metallic compounds; (6) comp substances; (7) emission from oxide cathodes; (8) all with high secondary emission coefficients. A bib graphy of 61 recent titles is given. No discussion theoretical results is included. A. H. W

537.542 = 4

An accurate method of determining the efficacy Geiger–Müller counters. ROGOZINSKI, A., AND VOISIN, *C.R. Acad. Sci., Paris*, **225**, 409–11 (*Aug.* 25, 1947) *French.*—A flat beam of cosmic rays only about 6 r thick is delineated by a "telescope" of G.M. count arranged 2 in coincidence and 4 in anticoinciden This is used to trace the shape of the sensitive region a counter, axially and transversly. Comparative rest using a flat beam of γ-rays are shown. L. E.

537.542 : 535.14.08 = 4

The influence of the counting-rate, wavelength incident [ultra-violet] flux, and the applied voltage, on response curves of CuI/alcohol photon counters. LORME S. *C.R. Acad. Sci., Paris*, **225**, 453–5 (*Sept.* 15, 1947) *French.*

537.566.2 : 535.135 = 4 *see Abstr.* 72

537.568

The energies of uniformly accelerated particles in gas. II. Positive ions. YARNOLD, G. D. *Phil. Ma* **38**, 186–99 (*March*, 1947).—An application is made the method of computation previously developed [Abs 2833 (1945)] to the energy charges experienced by a gr number of ions in a succession of free paths and collisi in a definite interval of time. The statistical study of energy changes of 200 ions during an interval in wh each ion makes, on the average, about 10 collisions, l given an estimate of the mean energy under equilibri conditions, and has shown that the form of the dis bution differs greatly from the Maxwellian. T mechanics of collisions is firstly discussed and then statistical experiments. Ionization by collision is stud but the ionization coefficient cannot be estimated u the mean free path of positive ions of high energy known. L. S.

537.583 : 535.215 : 621.385.032.216 = 4

The influence of light on the working of oxide cathod DEBIESSE, J., AND CHAMPEIX, R. *C.R. Acad. Sci., Pa.* **225**, 404–5 (*Sept.* 1, 1947) *In French.*—The cathode o diode was illuminated through a slot in the anode. room temperature a feeble photo-electric current v observed. When the cathode was at its operat temperature considerable increases in current resul from the illumination, so long as the thermionic emiss was not saturated. It is concluded that the phenomer is of photoelectric origin. A. H. W

COSMIC RAYS 537.591

537.591.1 : 537.133

Compatibility of primary protons with the ato annihilation hypothesis. TURNER, H. *Phys. Rev.*, 512–13 (*Sept.* 15, 1947).—An error is pointed out in calculations of Millikan, Neher, and Pickering [Abs 2202 (1943)] which vitiates the contention that electr are the principal components of the primary radiation W. E.

537.591.1 : 537.133

Primary cosmic-ray protons and the atom-annihilat hypothesis. MILLIKAN, R. A., NEHER, H. V., A PICKERING, W. H. *Phys. Rev.*, **72**, 513 (*Sept.* 15, 1947) The correction [Abstr. 141 (1948)] has already b made [Abstr. 1876 (1945)] and is accepted. W. E.

91.1 : 539.18 = 5 143
the disintegration of slow mesons. CONVERSI, M., PICCIONI, O. *Nuovo Cim.*, **2**, 71–87 (*April*, 1944) *alian.*—In order to find the percentage of slow ns which decay, the authors measured the delayed idences between two sets of counters separated by of Fe. About half of the ionizing particles of the component were found to disintegrate. G. P. S. O.

91.1 : 539.18 = 5 144
e half-life of the meson. COCCONI, G., AND TONöt, V. *Nuovo Cim.*, **2**, 93–100 (*April*, 1944) *In n.*—The hard component intensity of the cosmic tion at several inclinations to the vertical has been ured with a counter telescope. The ratio $\tau/\mu c^2$ is ant and equal to $2{\cdot}6 \pm 0{\cdot}3 \times 10^{-14}$ sec/eV. G. P. S. O.

91.1 : 539.18 = 5 145
the hypothetical short-lived meson. FERRETTI, B. *o Cim.*, **3**, 307 (*Oct.*, 1946) *In Italian.*—If the thetical mesons of 10^{-8} sec ½-life exist and are rated in numbers comparable with ordinary mesons, have a finite probability of reaching sea level. If energy $\simeq 10^{12}$ eV there is a relatively high probability they will then decay, giving rise to high energy rons. The anomaly in the electron spectrum in the energy region (10^{11}–10^{12} eV) which this process ld yield, has not been observed. G. P. S. O.

591.15 = 5 146
e density distribution in the extensive air showers. ONI, G., AND FESTA, C. *Nuovo Cim.*, **3**, 297–300 ., 1946) *In Italian.*—The particle density of the sive showers has been investigated. No evidence of concentrations of the particles has been found. G. P. S. O.

591.15 : 539.18 = 5 147
n the presence of extensive meson showers in extensive ers in the air. COCCONI, G., LOVERDO, A., AND GIORGI, V. *Nuovo Cim.*, **1**, 49–55 (*Feb.*, 1943) *In an.*—By means of 4 groups of counters, unscreened, nged at the corners of a square of side 2 m, and two cope systems of counters, screened by 15 cm of Pb, as found that showers of penetrating particles are ly always associated with the particularly dense air vers. The absorption curve is similar to that for ons. G. P. S. O.

591.3 = 5 148
n the absorption of the electronic component of cosmic ation. CACCIAPUOTI, B. N., AND PICCIONI, O. *vo Cim.*, **1**, 3–11 (*Feb.*, 1943) *In Italian.*—Experiments carried out at sea level and at 3 500 m above, on absorption of the soft component of cosmic rays in up to 20 cm thickness, and in Al up to 30 cm. The lts show a rough qualitative agreement with Arley's ry, but there seems to be a greater contribution from trons of low energy than predicted by this theory. electron spectrum seems to vary with altitude. G. P. S. O.

591.3 = 5 149
n the fine structure of the zenithal curve for cosmic . TONGIORGI, V. *Nuovo Cim.*, **1**, 96–100 (*April*, 3) *In Italian.*—An investigation was made on the ation of the intensity of the penetrating radiation with ction of incidence (with respect to the zenith), at 0 m above sea level. The absorption curves do not w the fine structure found by Schremp and other erican authors. G. P. S. O.

591.5 150
ote on the barometric coefficient of cosmic-ray intensity. NAPILLAI, M. *Phys. Rev.*, **72**, 518 (*Sept.* 15, 1947).—By using Penner's data [Haurwitz, *Dynamic Meteorology*, (1941)] on pressure variations in the atmosphere, and experimental data on the production and decay of mesons, the barometric coefficient is calculated and found to agree with that derived by Duperier [Abstr. 1816 (1944)]. W. E. D.

537.591.5 : 523.854 151
On the magnetic field of the Milky Way and its effect on cosmic radiation. VALLARTA, M. S. *Phys. Rev.*, **72**, 519 (*Sept.* 15, 1947).—It is recalled that if weak magnetic coupling exists between the stars of a galaxy there will be no effect on an isotropic distribution of charged cosmic rays entering the galaxy. An effect in our own galaxy can therefore only be expected if strong stellar dipole moments, $>10^{38}$ gauss cm^3, are found. W. E. D.

MAGNETISM 538

538.12 152
On the fundamental vector of the magnetic field and the magnetostatic pressure. DA SILVEIRA, A. *Phil. Mag.*, **38**, 339–42 (*May*, 1947).—A distinction is made between the magnetic induction vector, and the magnetic intensity. Integral relations connecting these are set up and simplified in some particular cases. L. S. G.

538.12 153
On magnetic field theories. LIVENS, G. H. *Phil. Mag.*, **38**, 453–79 (*July*, 1947).—A review of the different aspects of the theory and their mutual relations. It is concluded that there is no alternative theory of the mathematical and physical relations of the magnetic field which are comparable with the original simple theory of Poisson, Kelvin and Maxwell. L. S. G.

538.222 = 4 154
Specific magnetic susceptibility of mixtures of alcohol and aromatic amines. HATEM, S. *C.R. Acad. Sci., Paris*, **225**, 296–8 (*Aug.* 4, 1947) *In French.*—The specific susceptibilities (χ) of homogeneous mixtures of EtOH with aniline, *o*-toluidine; *m*-toluidine, *p*-toluidine, and pyrrole give the same type of curve when χ is plotted against concentration. On increasing the amount of amine, χ values are < those expected on a strictly additive relation until a particular concentration, C (which depends on the amine) is reached when the two values agree. At still higher concentration of amine, the experimental χ values are > the additive values. For mixtures of EtOH with quinoline and pyridine similar behaviour is shown up to concentration C but at higher concentrations no deviations from additivity are shown. W. R. A.

538.222 = 4 155
[Magnetic] susceptibilities of mixtures of alcohols and amines. HATEM, S. *C.R. Acad. Sci., Paris*, **225**, 332–4 (*Aug.* 11, 1947) *In French.*—Mixtures of aniline, $PhNH_2$ and *n*- and *iso*-propyl alcohol behave in the same way as aniline and EtOH [Abstr. 154 (1948)]. On the other hand, strict additivity is given with the following mixtures: $PhNH_2$–MeOH, $PhNH_2$–isopropyl oxide, EtOH–α-naphthylamine hydrochloride (I), toluene-I, hexane-I, C_6H_6-aniline hydrochloride. The anomaly would appear to arise from formation of an alcoholate of the amine. W. R. A.

538.224 : 535.218 = 4 156
Magnetic susceptibility and photosensitivity of lead bromide. DELGERY, I. *C.R. Acad. Sci., Paris*, **225**, 298–300 (*Aug.* 4, 1947) *In French.*—Freshly prepared $PbBr_2$ has a specific susceptibility (χ) of $-0{\cdot}275 \times 10^{-6}$ which does not change if the specimen is kept in the dark. On

exposure to daylight χ decreases in about 2 weeks .o $-0{\cdot}249 \times 10^{-6}$, whereas exposure to u.v. radiation causes more rapid and greater decrease to $-0{\cdot}233 \times 10^{-6}$. This decrease in χ is attributed to deformation of the Br ions. W. R. A.

ELECTROMAGNETISM . ELECTRODYNAMICS 538.3/.5

538.3 = 4 157

On the matrix form of Maxwell's equations. BAUDOT, J. *C.R. Acad. Sci., Paris*, **224**, 1622–4 (*June* 9, 1947) *In French.*—Darwin's matrix form, involving a wave function with 6 components, is extended into a single matrix equation, by adjoining 2 fictitious components. This equation involves matrices of order 8 which belong to the same group as the Dirac matrices. Various transformations of the equation are considered. L. S. G.

538.3 = 4 158

A new representation and a more general form of the equations of classical electromagnetism. DURAND, E. *C.R. Acad. Sci., Paris*, **225**, 567–9 (*Oct.* 6, 1947) *In French.*—The quantities $M_{pq} = (\psi_k^* b_{pq} \psi_k]$ formed with Dirac's 16 matrices satisfy, when conveniently arranged, the same relations as the Maxwell tensor. If the b_{pq} are obtained by asymmetric multiplication of 4 basic matrices, a generalization of Maxwell's equations is obtained. L. P.

538.3 : 531.51 : 530.12 *see Abstr.* 26

538.31 : 537.122 : 530.14 *see Abstr.* 32

538.32 159

A paradox in electrodynamics. TRIPP, W. A. *Phil. Mag.*, **38**, 149–51 (*Feb.*, 1947).—Further discussion of a problem treated recently by Robertson [Abstr. 1904 (1945)]. L. S. G.

538.56 : 535.13 *see Abstr.* 71

538.56 : 535.312 = 4 160

A study of the wave obtained by total reflection in media with non-vanishing magnetic susceptibility. ARZELIES, H. *Ann. Phys., Paris* (*Sér.* 12) **2**, 517–35 (*Sept.–Oct.*, 1947) *In French.*—The following are discussed: (*a*) The phase shift in the cases $E_\perp$ and $E_{||}$. (*b*) Polarization of the reflected wave. (*c*) Applications to the technique of cm- and mm-waves. (*d*) The sign convention. L. P.

538.566.2 : 621.396.11 161

A method of determining the velocity of radio waves over land on frequencies near 100 kc/s. MENDOZA, E. B. *J. Instn Elect. Engrs, Pt III*, **94**, 396–8 (*Nov.*, 1947).—[Abstr. 168 B (1948)].

538.566.2 : 621.396.11 162

The measurement of the velocity of propagation of centimetre radio waves as a function of height above the earth. I. Ground-level measurements of the velocity of propagation over a sea path. JONES, F. E. *J. Instn Elect. Engrs, Pt III*, **94**, 399–401 (*Nov.*, 1947).—[Abstr. 169 B (1948)].

538.569.4 : 535.33.072–14 *see Abstr.* 88

538.569.4 : 535.34 = 4 163

The electromagnetic energy dissipated in a medium with selective absorption. ARZELIÈS, H. *Ann. Phys., Paris* (*Sér.* 12) **2**, 536–54 (*Sept.–Oct.*, 1947) *In French.*—The e.m. energy dissipated in a medium with selective absorption is calculated: (*a*) by the usual application of the Poynting theorem; (*b*) directly, by calculating, under certain hypotheses, the work done by the wave on the ions of the medium. The two methods lead to the same results. Applications are made to plates and prisms. L. P.

538.615 : 535.33 = 4 *see Abstr.* 87

538.652 : 620.172.222 = 4

Experiments on magnetostriction in nickel. ROCARD *Rev. Sci., Paris*, **85**, 195–204 (*Feb.* 15, 1947) *In Frenc* Discusses conditions obviating magnetostrictive l teresis, and gives values for direct and inverse n netostriction coefficients. For the inverse case, i reported that magnetostriction hysteresis depends on application of stresses beyond the elastic limit. Exp ments on various types of closed magnetic circuit described, and constant-H and constant-B conditions discussed. A balanced magnetostrictive strain gaug briefly described. N. F

ATOMIC AND MOLECULAR STRUCTURE

539.11 : 536.421.1 *see Abstr.* 114

539.11 : 536.48 = 4

On the energy at absolute zero of lithium hydride deuteride. DE GROOT, S. R., AND BIEDERMANN, M. *Physica, 's Grav.*, **8**, 905–22 (*Sept.*, 1941) *In Frenc* The zero point energy of crystals of LiH and LiD approximated in two different ways. In the first pl a formula of F. London, found by quantization of mean free path in condensed systems of rigid spheres applied. Adjusting a parameter so as to find the ri difference of lattice constants between LiH and L yields reasonable values of the zero point energy. In second place, in a purely theoretical investigation of lattice vibrations by means of the general theory Lyddane and Herzfeld for polar crystals of the NaCl ty the zero point energies of $(E_0)_{LiH} = 5{\cdot}49$ kcal/mole a $(E_0)_{LiD} = 4{\cdot}30$ kcal/mole are calculated. The orig of these high values and the limitations of the theory discussed.

539.11 : 539.152.2

Studies of the solid state by means of nuclear magneti ALPERT, N. L. *Phys. Rev.*, **72**, 637–8 (*Oct.* 1, 1947) CH_3D has two λ-point transitions in the solid state $15{\cdot}5°$K and at $22{\cdot}6°$K. The change at the upper po from a narrow to a broad nuclear magnetic resona absorption indicates a transition from a free to a hinde molecular rotation. As there was no change in line wi between 80°K and 159°K in HCl the first order transiti observed at $98{\cdot}4°$K is attributed to a transition betwe ordered and disordered arrays of dipoles. Pale cre rubber showed no change in resonance width over t region between 24°C and −75°C, but the amplitu dropped by a factor of 10 at the lower temp. indicati possibly that fewer atoms were rotating. Other obser tions were made on rubber. W. E.

539.11 : 539.4.011.1 : 539.32 : 548.7 *see Abstr.* 202

539.11 : 548.0 : 539.32 *see Abstr.* 196

539.11 : 548.7

Vibrations of a finite linear lattice and Born's cyc lattice hypothesis. NAGENDRA NATH, N. S. *Bull. Pat Sci. Coll. Phil. Soc.* (*No.* 17) 10–22 (*Jan.*, 1947).— exact solution for the vibrations of a finite linear latt of N particles is compared with a calculation by the Bo method. The Born method gives rough agreement frequencies with the exact solution, but gives degenera which should be absent, and omits one fundamen frequency. It also gives incorrect normal modes vibration for half the levels. G. J.

539.13 : 535.375.5 *see Abstr.* 100

539.132 : 539.152.1 : 535.343.4–14 *see Abstr.* 96

2.1 168
-empirical theory of the nuclear energy surface. RG, E. *Rev. Mod. Phys.*, 19, 239–58 (*July*, 1947).— a detailed discussion of the packing fraction curve uclear stability in relation to the semi-empirical of nuclear energy, which divides it into volume, , symmetry and Coulomb energies. This theory en revised, especially with respect to allowances expansion of the nucleus. The calculated packing curve is largely independent of the bulk modulus nucleus and is determined, along with the para- in the energy expression, by the mass differences bars ($N - Z = \pm 1$). The bulk modulus is d by a comparison with the results of Bohr and on nuclear fission. G. J. K.

2.1 = 396 169
he structure of atomic nuclei. WERGELAND, H. ke Vidensk. Selsk. Skr. (*No.* 1) 68 *pp.* (1941) *In ian. Summary in German.*—A good summary of nventional theory of nuclear forces using direct als or meson field theory. In Part II the α-particle is discussed and the binding energy of Be^8 is ted, giving good agreement with experiment. G. J. K.

2.1 = 4 170
retical study of the mass defect and the β-stability y nuclei. ALLARD, G. *J. Phys. Radium* (*Sér.* 8) 2 (*March*, 1947) *In French.*—From the equilibrium eavy nucleus treated as a continuous medium of n density with four constituents (protons and s with + or − spins) an expression for the mass is obtained which is very similar to the semi- al formula of Weizsäcker, but allows for spin, ves good numerical results. A simple meson al and a special distribution of kinetic energy are d, and Coulomb energy is neglected. G. J. K.

2.1 : 530.14 *see Abstr.* 33

2.1 : 539.132 : 535.343.4–14 *see Abstr.* 96

2.2 171
magnetic moment of Tl^{205}. Poss, H. L. *Phys.* 2, 637 (*Oct.* 1, 1947).—Nuclear magnetic moment and H^1 were compared by the magnetic resonance [Abstr. 2616 (1947)] using separate circuits bu e magnetic field. The final value of the magnetic t of Tl^{205} is given as 1·628 nuclear magnetons. W. E. D.

2.2 : 539.11 *see Abstr.* 166

1 : 535.338.3 172
tral lines and the vibratory electron. JONES, E. T. *fag.*, 38, 533–42 (*Aug.*, 1947).—A continuation of s work [Abstr. 2610 (1942)]. The frequencies of ctral lines of the H atom are calculated. The eus is held to consist of a neutron attached to a n with no alteration in its free frequency. This $2{\cdot}8 \times 10^{-13}$ cm for r_0, the distance of closest ch of the electron to the nucleus, which distance the ranges of r that give the emission frequencies. esent paper shows the difference between the ry electron theory and those theories in which the is treated as an electrified particle in the Coulomb the nucleus. L. S. G.

2.2 173
isotopic composition of normal krypton and xenon. BURY, M., EPSTEIN, S., AND THODE, H. G. *Phys.* 2, 517–18 (*Sept.* 15, 1947).—A discrepancy of 10% abundance of Kr^{80} compared with the results of Abstr. 5151 (1937)] is found, but Nier has dis- l an error in his computations and a discrepancy of only 1% remains for Kr^{78} and Kr^{80}. Isotopic abundance of the Xe isotopes agrees with that of Nier. W. E. D.

539.155.2 : 533.15 *see Abstr.* 57

RADIOACTIVITY . NUCLEAR DISINTEGRATION NUCLEAR PARTICLES 539.16/.18

539.16.08 : 621.318.57 = 4 174
An electronic [pulse] amplitude analyser incorporating a reduction scale. KAHAN, T., AND KWARTIROFF, A. *J. Phys. Radium* (*Sér.* 8) 7, 357–9 (*Dec.*, 1946) *In French.*—[Abstr. 121 B (1948)].

539.162 = 4 175
The radioactive descent of $^{225}_{87}$AcK. GUILLOT, M., AND PEREY, M. *C.R. Acad. Sci., Paris*, 225, 330–2 (*Aug.* 11, 1947) *In French.*—A preparation of Ac freshly separated from its daughter products was brought into contact with some photographic plates for 10 sec. The plates were developed after exposure periods of 1 hr and 48 hr. In the former case, single α-tracks of AcX, RAc, AcC and Ac were identified (with evidence for some short-range Ac α-particles in addition to the main group). In the latter case, numerous stars were observed, with α-tracks from Ac, AcX, An, AcA and AcC, thus proving the descent Ac (α) → AcK (β) → AcX. A. P. F.

539.162 : 778.3 176
On the interpretation of radioactive thorium stars in a photographic emulsion. WESTÖÖ, R. *Ark. Mat. Astr. Fys.*, 34B (*No.* 22) 8 *pp.* (1947).—The new Ilford nuclear research plates have been used to study the Th disintegration series. The plates were soaked in various Th solutions. The relative penetration of the radioactive material when dissolved in water, alcohol and dilute hydrochloric acid, has been investigated. G. P. S. O.

539.163 : 539.166 177
γ-radiation of Na^{24} and the energy-level scheme of Mg^{24}. WIEDENBECK, M. L. *Phys. Rev.*, 72, 429–30 (*Sept.* 1, 1947).—To check the simplicity of the Na^{24} β-spectrum, the β–γ coincidence rate was determined as a function of thickness of β-absorber. The curve is independent of β-energy, thus confirming that the β-spectrum is simple. It is possible to differentiate between alternative level schemes for Mg^{24} by determining the γ–γ and β–γ coincidence rates, and an arrangement of counters used for this purpose is described. The cascade level scheme involving 2·8 MeV radiation [see Abstr. 1279 (1947)] is supported by the experimental results. A. J. M.

539.163 : 550.367 *see Abstr.* 205

539.163.2 178
A coincidence study of Ga^{72}. MANDEVILLE, C. E., AND SCHERB, M. *Phys. Rev.*, 72, 520–1 (*Sept.* 15, 1947) — β–γ and γ–γ coincidence measurements in conjunction with absorption measurements give a max. energy of 0·72 MeV for the soft β-ray from Ga^{72} and a γ-energy of 2·29 MeV. W. E. D.

539.163.2 : 537.133 : 539.165 179
On the positively charged particles accompanying the beta-rays of P^{32}. PI, T. H., AND CHAO, C. Y. *Phys. Rev.*, 72, 639–40 (*Oct.* 1, 1947).—See Abstr. 3193 (1946). The number of positive tracks accompanying the β-rays from a bare P^{32} source is less than experimental error, and experiments with filters indicate that the positive particles are produced during the passage of the β-rays through matter. W. E. D.

539.163.2 : 539.165 : 539.166 180
Radiations from K^{38}. RAMSEY, M. M., MEEM, J. L., JR., AND MITCHELL, A. C. G. *Phys. Rev.*, 72, 639 (*Oct.* 1, 1947).—K^{38} and Cl^{38} both decay to A^{38} by positron and negatron emission respectively. A γ-radiation with

energy between 2·0 and 2·15 MeV associated with the decay of K^{38} is identified with the 2·15 MeV. γ-rays observed by Hole and Siegbahn [Abstr. 151 (1947)] in work on Cl^{38} and assigned to a γ-ray transition in A^{38}. The max. energy of the K^{38} positrons was found to be 2·53 MeV and the $\frac{1}{2}$-life 7·5 min. W. E. D.

539.163.2 : 539.165 : 539.166 181

On the β- and γ-radiation from U^{239} and Np^{239}. Slätis, H. *Ark. Mat. Astr. Fys.*, 35A (*No.* 3) 23 *pp.* (1947).—The γ-radiations were studied by the absorption method, and by observation in a β-ray spectrograph of the Compton- and photo-electrons ejected from a thin Pb foil. The β-ray spectra were analysed in the spectrograph. The decay of U^{239} appears to be by a 2·06 MeV β-ray, or by a 1·12 MeV β-ray followed by two γ-rays. The decay of Np^{239} is far more complicated than this, exhibiting 4 primary β-rays, and numerous internal conversion β-rays associated with 6 γ-rays. A. P. F.

539.163.2 : 539.166 182

On the gamma-rays of K^{40}. Gleditsch, E., and Gráf, T. *Phys. Rev.*, 72, 640–1 (*Oct.* 1, 1947).—The energy of the γ-rays was found to be $1{\cdot}55 \pm 0{\cdot}05$ MeV compared with 2MeV [Gray and Tarrant, Abstr. 1089 (1934)]. The quanta emitted/sec by 1 g of K = rate of emission from $1{\cdot}23 \pm 0{\cdot}15 \times 10^{-10}$ g of Ra. Further deduction yields a result of $7 \pm 1{\cdot}5$ γ-quanta per 100 β-rays emitted by K^{40}, and a proposed disintegration scheme is given. W. E. D.

539.164.2 : 539.166 = 4 183

On the range in air of α-rays emitted by Ac. Grégoire, R., and Perey, M. *C.R. Acad. Sci., Paris*, 225, 733–4 (*Oct.* 27, 1947) *In French.*—By comparison with α-particles of Po whose range was taken to be 3·84 cm, Ac was found to emit two groups of α-particles of ranges $3{\cdot}46 \pm 0{\cdot}02$ cm and $3{\cdot}1 \pm 0{\cdot}05$ cm, the latter having an abundance of about 15% that of the more energetic group. Thus there is to be expected one 0·35 MeV γ-ray per 500 Ac disintegrations. W. E. D.

539.165 : 537.133 : 539.163.2 *see Abstr.* 179

539.165 : 539.166 : 539.163.2 *see Abstr.* 180–1

539.165 : 539.167.3 *see Abstr.* 187

539.165.2 184

H^3 and the mass of the neutrino. Konopinski, E. J. *Phys. Rev.*, 72, 518–19 (*Sept.* 15, 1947).—On the assumption of a fixed relationship, for all allowed β-transitions, between the $\frac{1}{2}$-life, the "nuclear matrix element" and the max. β-energy, the values of these quantities for H^3 and He^6 are compared, and it is shown that the neutrino mass $\gtrsim$ 3% of the electronic rest mass. W. E. D.

539.166 : 539.163 *see Abstr.* 177

539.166 : 539.163.2 *see Abstr.* 182

539.166 : 539.164.2 = 4 *see Abstr.* 183

539.166 : 539.165 : 539.163.2 *see Abstr.* 180–1

539.166 : 549.211 185

Diamond as a gamma-ray counter. Curtiss, L. F., and Brown, B. W. *Phys. Rev.*, 72, 643 (*Oct.* 1, 1947).—Several diamonds, out of 100 tested, acted as γ-ray counters and gave pulses at least 10 × the total background noise of crystal + amplifier. Those giving good response were single water white crystals free from obvious flaws. W. E. D.

539.167.3 186

Nuclear isomerism in dysprosium 165. Inghram, M. G., Shaw, A. E., Hess, D. C., Jr., and Hayden, R. J. *Phys. Rev.*, 72, 515–16 (*Sept.* 15, 1947).—Both the 1·25 min and the 2·6 hr activities are produced by slow neutron irradiation of Dy^{164} and are assigned to Dy^{165}. A proposed level scheme places the shorter life e state 0·18 MeV above the longer. W

539.167.3 : 539.165

Formation and properties of radioactive li Hughes, D. J., Hall, D., Eggler, C., and Gold E. *Phys. Rev.*, 72, 646–7 (*Oct.* 1, 1947).—Experi are described which show that the 0·89 sec ac produced on bombardment of Li with neutrons i to the Li^8 isotope which is formed by the Li^7(reaction. A rough determination of the energy c β-particles from Li^8 indicates an upper limit of ~ 11 MeV. W.

539.172.3 : 537.133 = 3

Nuclear photo-effect with emission of a proton. Hu O., and Wäffler, H. *Helv. Phys. Acta*, 20 (*Nos.* 373–404 (1947) *In German.*—The (γ, p)-process has investigated with the following elements by mea Li γ-rays: Mg, Si, Ti, Cr, Se, Mo, Pd, Cd, and Sn. possible to remove a proton from the following isot Mg^{25}, Mg^{26}, Si^{29}, Si^{30}, Ti^{50}, Cr^{53}, Se^{77}, Mo^{98}, Cd^{111}, Cd^{112}, Cd^{113}, Sn^{117}, and Sn^{118}. The active product and its $\frac{1}{2}$-life are given in each case. effective cross-sections for the (γ, p) and (γ, n) pro for these nuclei have been determined, and their calculated. According to the Bohr model this should be the ratio of the emission probabilitie protons and neutrons from the intermediate nucle the theoretical values are 100 to 1 000 × smaller tha experimental values. A.

539.172.4 = 4

A study of the reaction $F^{19}(n, \alpha)N^{16}$. Bleuler, E. Rossel, J. *Helv. Phys. Acta*, 20 (*Nos* 4–5) 445–54 *In French.*—F in the form of CF_4 or SiF_4 in an ioniz chamber at ~ 4 atmos. pressure was bombarded neutrons of 3·68 MeV from a D + D source. α-particle pulse size distribution was measured; α-t from ThC′, ThC, Po and $N^{14}(n, \alpha)$ were used to est the energy scale. The energy of reaction was fou be $-0{\cdot}73$ MeV. Several α-particle groups detected, the least energetic corresponding to form of N^{16} at 1·64 MeV above the ground state. A.

539.172.4 : 539.185.7 = 4 *see Abstr.* 194

539.18 : 530.145

On the production process of mesons. Weisskopf, *Phys. Rev.*, 72, 510 (*Sept.* 15, 1947).—The fact tha probability of nuclear capture of slow mesons is ≪ to be expected from a knowledge of their produ cross-section is emphasized; a possible explanati proposed that there is an intermediate, as yet undete stage in the production which does not make the ca process the reverse of that of production. This mediate stage is referred to as a "meson-pregnant" and a large life for this state would lead to a small action between mesons and nucleons. W.

539.18 : 530.145 = 4 *see Abstr.* 38

539.18 : 537.591.1 = 5 *see Abstr.* 143–5

539.18 : 537.591.15 = 5 *see Abstr.* 147

539.185

On the space energy distribution of neutrons moderator of infinite size. Holte, G. *Ark. Mat. Fys.*, 35A (*No.* 2) 12 *pp.* (1947).—Following the ge procedure of Waller [Abstr. 2248 (1947)], and assu the variation of mean free path with energy to be by $\lambda(E) = \lambda_0 + \lambda_1(E/E_0)^b$, the distribution functio its second and third moments are derived. Agree with experiment is quite good for slow neutrons duced from a fast neutron source in graphite. A.

= 4 192

diffusion length of thermal neutrons in water. LOT, A., COHEN, R., AND REEL, H. *C.R. Acad. ris*, **225**, 406–7 (*Aug.* 25, 1947) *In French.*—Using a–Be source immersed in H_2O, the radial distri- of those neutrons absorbed by B and Cd were Their diffusion lengths were found to be 2·88 7 cm respectively. A. P. F.

.7 193

y of the slowing down of neutrons by elastic n with atomic nuclei. MARSHAK, R. E. *Rev. Mod.* 19, 185–239 (*July*, 1947).—After the derivation of nsport equations, a number of problems of energy tion are solved both with stationary and time- ent solutions. The energy distribution of neutrons given number of collisions is also discussed. The distribution of the neutrons is considered as a problem of the calculation of the space-moments distribution, including the second-moment, or g-down length, and as a solution of the simplest der approximation assuming an almost isotropic tion slowly varying with energy. Means of ing this approximation are discussed. Numerical for the second-moment are given. At each stage, e approximations for both light and heavy ts are given. The effects of chemical binding are d. G. J. K.

5.7 : 539.172.4 = 4 194

surement of the ratio of the capture cross-sections neutrons by Mn and H. BALLINI, R., BERTHELOT, D SMEETS, C. *C.R. Acad. Sci., Paris*, **225**, 328–30 11, 1947) *In French.*—A 1 g Ra–Be source was ded in a sphere of an aqueous solution of Mn surrounded by a large body of water. The γ-activities of the Mn were measured as functions Mn concentration. From the results the cross- ratio Mn/H was found to be 42 ± 1·5. A. P. F.

STRUCTURE OF SOLIDS 539.2

3 : 666.115 : 535.327 = 4 *see Abstr.* 86

: 548.74 = 3 195

crystallite size of thin antimony layers. LOTMAR, Helv. Phys. Acta, **20** (*Nos* 4–5) 441–5 (1947) *In n.*—By electron microscope and electron diffrac- xamination it is shown that evaporated layers of e composed of crystallites of about 10 microns ter, which in turn are composed of a mosaic whose individual elements measure about 30 millimicrons across. J. T.

ELASTICITY . STRENGTH . RHEOLOGY 539.3/.8

539.32 : 539.11 : 539.4.011.1 : 548.7 *see Abstr.* 202

539.32 : 539.11 : 548.0 196

Calculation of the shear elastic constants of the alkali halides. PRICE, W. J. *Phys. Rev.*, **72**, 514–15 (*Sept.* 15, 1947).—The calculations of Fuchs [Abstr. 431, 4993 (1936)] on Cu and alkali metals have been extended to the alkali halides NaCl, KBr, KI, KCl and the results do not agree very well with theory. It is pointed out that the results are very sensitive to the type of repulsive force chosen. W. B. D.

539.32.08 : 534.232 : 534.321.9 = 4 *see Abstr.* 68

539.37 : 539.4.011.25 197

Stress-strain compatibility in greatly deformed engineering metals. SWAINGER, K. H. *Phil. Mag.*, **38**, 422–39 (*June*, 1947).—Elastic, plastic and inelastic stress-strain compatibility are discussed, and the stress-strain expressions of recent papers are generalized. Isotropic inelastic metals with constant moduli, or with moduli a function of position, are treated. It is suggested that the problem of rupture under complex stresses can be approached, now that strains of any magnitude can be analysed. L. S. G.

539.389.1 198

On the upper yield point: its occurrence in bending tests and its explanation. BENEDICKS, C., AND SKORSKI, R. *Ark. Mat. Astr. Fys.*, **34A** (*No.* 20) 17 *pp.* (1947).—See Abstr. 3693 (1947). This paper describes the experiments and discusses the proposed explanation at length. L. G. C.

539.4.011.1 : 539.32 : 539.11 : 548.7 *see Abstr.* 202

539.4.011.25 : 539.37 *see Abstr.* 197

539.4.013 : 536.413 : 531.259 *see Abstr.* 43

539.501 199

Rectilinear plastic flow of a Bingham solid. II. Flow between confocal elliptic cylinders in relative motion. OLDROYD, J. G. *Proc. Camb. Phil. Soc.*, **43** (*Pt* 4) 521–32 (1947).—The methods of an earlier paper [Abstr. 2671 (1947)] are extended to the case of confocal elliptic cylindrical boundaries. Variation of the velocity distribution with the dimensionless parameter S is computed; for $S = 0$ it is that of a Newtonian liquid. The extents of the plastic and elastic regions are obtained for several cases. Some results are shown diagrammatically. G. O. B.

PHYSICAL CHEMISTRY 541

ADSORPTION 541.183

3 : 536.7 : 532.61 *see Abstr.* 51

CHEMICAL PROCESSES 542.9

3 : 548.3 = 4 *see Abstr.* 201

CHEMICAL ANALYSIS 543/545

545.7 : 536.253.097 200

A new physical method of analysing gas mixtures containing a dipole gas as component. KRONIG, R. *Physica, 's Grav.*, **9**, 632 (*July*, 1942).—The method suggested is based on the influence of electric fields on the heat convection. H. L.

CRYSTALLOGRAPHY 548

: 535.515.096 *see Abstr.* 108

: 535.55 *see Abstr.* 109

: 539.11 : 539.32 *see Abstr.* 196

: 542.943 = 4 201

uence of the crystalline orientation on the hot ion of iron and copper. BÉNARD, J., AND TALBOT, J. *C.R. Acad. Sci., Paris*, **225**, 411–13 (*Aug.* 25, 1947) *In French.*—The rates of oxidation at 900°C of Cu crystal faces increase in the order (123), (100), (111), (110) = (211), (210) = (221), the times of oxidation being some hours. The differences seem to be due to variations in the rate of diffusion of O through the Cu_2O layer, the orientation of which is related to that of the underlying

metal, though variations of the intrinsic rate of oxidation may play a part in the first few minutes. Similar but less definite results are obtained for Fe. A. J. C. W.

548.7 : 539.11 *see Abstr.* 167

548.7 : 539.11 : 539.4.011.1 : 539.32 202

A quantum-mechanical calculation of the cohesive energy, the interionic distance, and the elastic constants of some ionic crystals. LÖWDIN, P.-O. *Ark. Mat. Astr. Fys.*, 35A (*No.* 9) 10 *pp.* (1947).—The one-electron approximation is used for LiCl, NaCl and KCl, 3rd-order terms being neglected. Differences from the observed values range from 2% (lattice parameter) to ~20% (compressibility). A. J. C. W.

548.73 203

The crystal structure of lawsonite, $CaAl_2(Si_2O_7)(OH)_2.H_2O$. WICKMAN, F. E. *Ark. Kemi Min. Geol.*, 25A (*No.* 2) 7 *pp.* (1947).—Weissenberg photographs show that lawsonite is orthorhombic, space group $C222_1$, $a = 8{\cdot}88$, $b = 5{\cdot}75$, $c = 13{\cdot}30$ kX, with four "molecules" per unit cell. The proposed structure, g satisfactory agreement with the visual intensity estim contains Si_2O_7 groups. A. J. C

548.736.34

The crystal structure of aluminium chloride. KETEL J. A. A., MACGILLAVRY, C. H., AND RENES, P. A. *Trav. Chim. Pays-Bas*, 66 (*Nos* 7–8) 501–12 (*July–A* 1947).—$AlCl_3$ is monoclinic, pseudo-hexagonal, $5{\cdot}92 \pm 2$, $b = 10{\cdot}22 \pm 4$, $c = 6{\cdot}16 \pm 2$, $\beta =$ The Cl atoms are approx. close-packed, forn hexagonal layers between which Al atoms lie. The s ture is ionic, not molecular. All crystals examined twinned on the pseudo-hexagonal axis, and false peal the Fourier syntheses and certain streaks on Weissen photographs suggest the presence of mistakes in the sequence. A. J. C

548.74 : 537.533.73 = 3 *see Abstr.* 135

548.74 : 539.23 = 3 *see Abstr.* 195

MINERALOGY 549

549.211 : 539.166 *see Abstr.* 185

GEOPHYSICS 55

550.367 : 539.163 205

Significance of the radioactivity of potassium in geophysics. GLEDITSCH, E., AND GRÅF, T. *Phys. Rev.*, 72, 641 (*Oct.* 1, 1947).—Using revised data on radiation from K^{40} [Abstr. 182 (1948)] the importance of the part played by K in heating the earth in earlier times is shown; e.g. the heat produced by K^{40} alone was at the beginning of the earth's history 200× greater than that generated by all radioactive material to-day. W. E. D.

ATMOSPHERE . METEOROLOGY 551.5

551.510.535 : 551.594.5 : 621.396.812 = 4 206

Ionospheric perturbations in the zone of polar aurorae. RAWER, K. *Rev. Sci., Paris*, 85, 287–8 (*March* 1 *and* 15, 1947) *In French.*—Discussion of observations in Tromsö shows that many propagation anomalies can be explained by the behaviour of an auroral *E*-layer, due to corpuscular radiation from the sun. The development of a disturbance during the night and morning is described. As night progresses, the absorption of radio waves generally increases, but communication can often be maintained by use of considerably higher frequencies. The worst conditions usually occur towards 4 a.m., when the aurora and auroral layer are fading away, and such conditions may, in winter, last until afternoon. In sp and autumn, conditions generally improve again about 6 a.m. Such disturbances are often repeate successive nights. A

551.510.535 : 621.396.11

A frequency prediction service for South Africa special reference to an ionosphere recorder embod certain new techniques. HEWITT, F. J., HEWITT, J., WADLEY, T. L. *Trans. S. Afr. Inst. Elect. Engrs*, 180–97 (*July*, 1947).—[Abstr. 170 B (1948)].

551.575 : 534.222.2 : 536.421–4 = 4 *see Abstr.* 115

551.594.13 : 621.317.723 = 4

An electrometer with valves for the measuremen atmospheric electricity. GRENET, G. *C.R. Acad. Paris*, 225, 585–6 (*Oct.* 6, 1947) *In French.*—[Abstr. 1 (1948)].

551.594.4 : 535.332 = 4 *see Abstr.* 90

551.594.5 : 621.396.812 :
551.510.535 = 4 *see Abstr.* 206

GLASS . CERAMICS 666

666.115 : 539.113 : 535.327 = 4 *see Abstr.* 86

666.329 : 621.315.612.3 : 537.226.8 *see Abstr.* 121

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778.3 : 539.162 *see Abstr.* 176

778.33 : 537.531 : 616–073.75 : 620.179.15 209

Medical, biological and industrial applications of monochromatic radiography and microradiography. CLARK, G. L. *Radiology*, 49, 483–95 (*Oct.*, 1947). — The crystallographic reflection method, analogous to the light prism reflection method for obtaining monochromatic X-radiation, is not practicable, owing to large absorption and small emission. A method is, however, available by operating X-ray tubes at voltages related to the *K*-emission voltages of the tube target, so that the general radiation component is small and the characteristic radiation component very large. Tungsten target tubes with a *K*-emission value of approximately 70 kV generally too hard for practical purposes but tubes v targets of Mo, Cu, Co and Fe have been manufactu with *K* values ranging from 20 to 6 kV. Batteries of s tubes may be used, step by step, to bring out differ details in order. The method was first applied to airc aluminium castings having minute cracks. Suitable pho graphic emulsions and intensifying screens are discuss Examples are given of the differing detail obtained w different target tubes. A most valuable application monochromatic radiation is in microradiographic wo many striking reproductions of radiographs of biolog and other specimens being given; such microradiogra are capable of magnification. S. J